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Vol. 10, No. 5 Suppl., March 15, 1956

GENERAL

RESEARCH PROGRAMS

2241   RL-28.5.135
[California. Univ., Berkeley. Radiation Lab.]
SUMMARY OF THE RESEARCH PROGRESS MEETING.
R. K. Wakerling. Apr. 10, 1947. Decl. Nov. 29, 1955.
6p. Contract W-7405-eng-48. $1.80(ph OTS);
$1.80(mf OTS).

Studies are being made of the metabolism of Cm and Am. Comparisons are made between the uptake of these elements in the liver and skeletal structure and the uptake of the other elements. Computations are being carried out on the curvature errors caused by scattering in cloud chamber measurements. (M.P.G.)

BIOLOGY AND MEDICINE

RADIATION EFFECTS

2242   AECD-3817
Hanford Atomic Products Operation, Richland, Wash.
RADIOLOGICAL SCIENCES DEPARTMENT RESEARCH AND DEVELOPMENT ACTIVITIES QUARTERLY PROGRESS REPORT [FOR] OCTOBER–DECEMBER 1954.
H. M. Parker. Jan. 10, 1955. Decl. with Deletions Dec. 7, 1955. 27p. Contract W-31-109-eng-52. $4.80(ph OTS); $2.70(mf OTS).

Data are presented from a radiobiological ecological survey of the Columbia River and the Hanford area; studies on the toxicology of I^{131} in sheep; the effects of whole-body x irradiation in sheep; the effects of contact with radioactive particles on the skin of swine; Pu adsorption by rats; the absorption and tissue distribution of fission products in rats and mice; and tracer studies on plant metabolism of fission products. Research and development activities aimed at improving monitoring methods and instruments are discussed. The objectives of research and development activities of the Radiological Sciences Department are summarized. (C.H.)

2243   UR-399
Rochester, N. Y. Univ. Atomic Energy Project.
STUDIES OF FLASH BURNS: AN INVESTIGATION OF THE EFFECTIVENESS OF THE "TAIL" OF A SIMULATED FIELD PULSE IN THE PRODUCTION OF SKIN BURNS IN PIGS. George Mixter, Jr. June 13, 1955. Decl. Dec. 9, 1955. 29p. Contract W-7401-eng-49. $4.80(ph OTS); $2.70(mf OTS).

A method is presented for the laboratory production of a simulant of the thermal characteristics of atomic weapons. Using anesthetized white pigs, it has been shown that the final 30% of the pulse tail fails to contribute significantly to burn sustained by bare skin under pulses simulating weapons from 10 k-ton to 10 m-ton. Skin covered with a single layer of fabric exhibits the same phenomenon except at the lowest kilotonnage tested. Amputation of as much as 50% of total pulse energy from the tail of the pulse causes a significant reduction of burn response by bare and fabric-covered skin under the full range of kilotonnages simulated. (auth)

RADIATION HAZARDS AND PROTECTION

2244   AECD-3808
Clinton Labs., Oak Ridge, Tenn.
TOLERANCE VALUES FOR THORIUM. Karl Z. Morgan.
Nov. 29, 1945. Decl. with deletions Dec. 5, 1955. 9p.
$1.80(ph OTS); $1.80(mf OTS).

Problems for consideration in calculating tolerance values for Th are summarized. Data are included on physical characteristics of Th. (C.H.)

2245   CF-47-8-240
[Oak Ridge National Lab., Tenn.]
[RIVER WATER MONITORING MEMO.] M. A. Buford.
Aug. 14, 1947. Decl. Nov. 29, 1955. 4p. $1.80(ph OTS); $1.80(mf OTS).

Data are presented from the radiometric analysis of water and mud samples collected during 1947 from the Clinch and Emory Rivers. (C.H.)

2246   CF-51-9-63
Oak Ridge National Lab., Tenn.
AIR ACTIVITY STUDIES CONDUCTED AT CORRYTON, TENNESSEE AND GAINESVILLE, FLORIDA. D. M. Davis and F. J. Davis. Oct. 25, 1951. Decl. Nov. 29, 1955. 10p. $1.80(ph OTS); $1.80(mf OTS).

The highest count due to Thorium was 475 c/m at Corryton, Tennessee and 83.7 c/m at Gainesville, Florida. There is no explanation for this large difference in counts between the two locations. The highest long-lived count at Corryton, Tennessee was 45.8 c/m and 113.9 c/m at Gainesville, Florida. The highest count for long-lived activity in water samples collected at Corryton was 28.5 c/m and the highest at Gainesville was 12.3 c/m. There appears to be no absolute correlation between the path of the radioactive clouds and the activities observed at Corryton and at Gainesville. In general, it would appear that peaks were observed in Florida for the first, second, and third tests, and that the peak at Corryton on May 2nd was due to the first test. The periodic increase of long-lived counts on the samples collected and the spots observed on several of the films indicate that there was a small amount of long-lived activity in the atmosphere at Corryton and Gainesville during the period the tests were being conducted at Eniwetok and shortly thereafter. Since the peaks of activity, especially at Corryton, were somewhat at random it would seem to indicate that measurements were made along the edge of the path of the activity

rather than directly in line with the movement of the main mass of particles. (auth)

2247   HW-25108

Hanford Works, Richland, Wash.
APPLICATION OF PLASTIC BAGS AND SHEETING FOR OPERATION AND MAINTENANCE ACROSS A CONTAMINATION BARRIER. Homer A. Moulthrop. Oct. 24, 1952. Decl. Dec. 6, 1955. 74p. [Contract W-31-109-eng-52.] $12.30(ph OTS); $4.50(mf OTS).

A description is given of the use of Vinylite sheeting for performing work and for making material transfers across a contamination barrier, the primary purpose being the elimination of open air transfers while performing the work. Special equipment and techniques involved are illustrated with 38 full-page photographs and detailed operational procedures are also presented. Illustrations include the use of plastic tunnels for entry of personnel into large contaminated enclosures. Arrangement of access ports and equipment to permit accessibility through plastic barriers is recommended for new installations. (auth)

2248   NYO-1521

New York Operations Office. Health and Safety Div., AEC.
SOIL AND WATER URANIUM AND RADIUM SURVEY. Progress Report. D. E. Lynch. June 20, 1950. Decl. Dec. 8, 1955. 45p. $7.80(ph OTS); $3.30(mf OTS).

Results of radiological surveys of selected areas in the United States indicate that the natural Ra content of soil varies from 9×10^{-13} to 15×10^{-13} g/g and the U content varies from 3×10^{-6} to 9×10^{-6} g/g. Surface streams and ground waters were found to be below 10^{-13} curies/g. (C.W.H.)

CHEMISTRY

2249   A-1268

Columbia Univ. Div. of War Research, New York.
THERMODYNAMICS OF PRODUCTION OF BORON METAL BY REDUCTION OF BORON HALIDES. Clyde A. Hutchison and James S. Smith. May 29, 1944. Decl. Dec. 8, 1955. 50p. Contract W-7405-eng-50. (100B-R-140) $7.80(ph OTS); $3.30(mf OTS).

Computations are presented of the free energy functions, heat capacities, and entropies of boron trichloride and boron trifluoride at 298.1°, 500°, 1000°, and 1500°K. Data are applied in calculations of the equilibrium constants for the reduction of BCl_3 and FB_3. Results are tabulated, and applications for production of B metal are discussed. (C.H.)

2250   A-3904

Du Pont de Nemours (E. I.) & Co. Pigments Dept., Wilmington, Del.
"A" REPORT ON LETTER CONTRACT W-7412-eng-129 COVERING PERIOD FROM JULY 16, 1944 TO JULY 31, 1944. H. C. Brill. July 31, 1944. Decl. Dec. 8, 1955. 10p. $1.80(ph OTS); $1.80(mf OTS).

Methods for preparing TiN, ZrN, and SiN are discussed. (L.M.T.)

2251   A-3905

Du Pont de Nemours (E. I.) & Co. Pigments Dept., [Wilmington,] Del.
"A" REPORT ON LETTER CONTRACT W-7412-ENG-129 COVERING PERIOD FROM JULY 31, 1944 TO AUGUST 15, 1944. M. C. Londergan, R. A. Gagnon, D. W. Lyon, and W. D. Ross. Aug. 15, 1944. Decl. Dec. 8, 1955. 12p. Contract W-7412-eng-129. $3.30(ph OTS); $2.40(mf OTS).

Preparation of zirconium nitride by treatment of $ZrCl_4$ with NH_3, preparation of cerium nitride by the reaction of liquid ammonia and $CeCl_3$, data on the spectrographic analysis of Li_3N, and the corrosion of metals under TiN reaction conditions are reported. (J.E.D.)

2252   AECD-3777

Brookhaven National Lab., Upton, N. Y.
PROGRESS REPORT ON WASTE PROCESSING DEVELOPMENT PROJECT. THE CONCENTRATION OF WASTE. B. Manowitz and R. Isler. Dec. 1, 1953. Decl. with deletions Dec. 2, 1955. 13p. $3.30(ph OTS); $2.40(mf OTS).

This report describes experimental and pilot plant development work and enlarges upon two schemes: the concentration of dilute waste solutions to 60 to 70% solids slurries in a batch slurry evaporator, removal of the residual water from the waste by evaporation, and fusion in the final waste container; accomplishment of the complete concentration and fusion cycle in one piece of equipment on a continuous basis. (auth)

2253   AECD-3793

Kellex Corp., New York.
RECOMMENDATIONS FOR THE STORAGE OF RADIUM CAKE. George White, Jr. and W. P. Lamb. May 20, 1949. Decl. with deletions Dec. 5, 1955. 27p. Contract AT-30-1-Gen-169. $4.80(ph OTS); $2.70(mf OTS).

Recommendations are presented for the storage of radium cake, and factors are discussed upon which these recommendations are based. (C.H.)

2254   AECD-3814

Knolls Atomic Power Lab., Schenectady, N. Y.
LIMITS OF INFLAMMABILITY AND IGNITION TEMPERATURES OF HEXONE IN AIR AND IN OTHER GASEOUS ATMOSPHERES. H. Ward Alter. Sept. 9, 1949. Decl. with Deletions Dec. 6, 1955. 7p. Contract W-31-109-eng-52. $1.80(ph OTS); $1.80(mf OTS).

Limits of inflammability of hexone in air and nitrogen oxide—air mixtures have been determined. Ignition temperatures of hexone in air and NO_2 atmospheres were also determined. (C.W.H.)

2255   AECD-3826

Metal Hydrides Inc., Beverly, Mass.
FINAL TECHNICAL REPORT FOR CONTRACT YEAR NOVEMBER 9, 1947 TO NOVEMBER 9, 1948. H. Brown and P. Woodberry. Nov. 9, 1948. Decl. with deletions Dec. 6, 1955. 28p. Contract AT-30-1-GEN-213. $4.80 (ph OTS); $2.70(mf OTS).

A procedure is described for the production of high-purity Ca by the electrolysis of $CaCl_2$. Preparation for electrolysis was effected by removing Al, Mn, Mg, Fe, Na, Li, and other impurities from the $CaCl_2$ by coprecipitation and ion exchange methods. This procedure for the purification of Ca was later abandoned in favor of vacuum distillation experiments. (K.S.)

2256 AECD-3927

Argonne National Lab., Lemont, Ill.

CHEMISTRY DIVISION, SECTION C-I SUMMARY REPORT FOR APRIL, MAY AND JUNE 1951. D. W. Osborne, ed. Aug. 1, 1951. Decl. with deletions Dec. 8, 1955. 23p. Contract W-31-109-eng-38. $4.80(ph OTS); $2.70(mf OTS).

The U^{238}(n,2n) cross section for thermal neutrons was determined by measuring the resultant Np^{237} or Pu^{238}, after using the neutron capture to measure the thermal flux. An isotopic abundance of $4 \times 10^{-6}\%$ and neutron absorption cross section of 5×10^{-2} barns was determined for Si^{32}. Heats of solution of $Co(NO_3)_2$ and $UO_2(NO_3)$ hydrates in dimethyl formamide and of $CoCl_2 \cdot 2H_2O$ and $CoCl_2 \cdot 6H_2O$ in various organic solvents were determined. The entropy, enthalpy, and heat capacity of ThO_2 from 10 to 300°K were determined. The thermodynamics of Np ions was further investigated. The migration of ions in ion-exchange resins during electrolysis was studied. Work on separating the actinides as a group from the lanthanides as a group by a solvent extraction technique was continued. (L.M.T.)

2257 LA-1550

Los Alamos Scientific Lab., N. Mex.

ELECTROCHEMICAL EXCHANGE OF SILVER AND POLONIUM. Leonard H. Treiman and Melvin G. Bowman. Mar. 1953. Decl. Dec. 12, 1955. 8p. Contract W-7405-eng-36. $1.80(ph OTS); $1.80(mf OTS).

It has been found that two Ag atoms replace one Po ion during the electrochemical exchange of Po^{2+} with Ag. The most probable exchange reaction may be described by the equation $Po^{2+} + 2Ag = Po + 2Ag^+$. From the concentrations of Po^{2+} ion and Ag^+ ion when the exchange reactions were terminated, calculations indicate $Po = Po^{2+} + 2e^-$, $E^0 < -0.7$. (auth)

2258 NAA-SR-1205

North American Aviation, Inc., Downey, Calif.

GENERAL CHEMISTRY QUARTERLY PROGRESS REPORT [FOR] JULY—SEPTEMBER 1954. Eugene L. Colichman, ed. June 1, 1955. Decl. Dec. 5, 1955. 51p. Contract AT-11-1-Gen-8. $9.30(ph OTS); $3.60(mf OTS).

The thermal and radiation stabilities of 1-Mev electron, fast neutron and γ-irradiated terphenyls were investigated. The organic pump loop was modified. Heat transfer data were obtained on p-terphenyl in the temperature range 550° to 850°F. Two analytical methods, infrared absorption, and ultraviolet absorption were outlined for tne analysis of terphenyls. Dissociation pressure data for zirconium hydride are given. Methods for the determination of O_2 in He, Na, and NaK are discussed. (For preceding period see NAA-SR-1087.) (C.W.H.)

2259 RMO-2709

Tennessee Valley Authority, Wilson Dam, Ala.

UTILIZATION OF FLORIDA LEACH ZONE MATERIAL. Progress Report for December 1952. Jan. 14, 1953. Decl. Nov. 28, 1955. 24p. $4.80(ph OTS); $2.70(mf OTS).

The recovery of additional phosphate by supplemental treatment of the tailing from the wet-grinding process was investigated. The calcination of unbeneficiated leach zone material was studied further in small-scale tests. Studies of the process in which unbeneficiated leach zone ore is extracted with HNO_3, the extraction filtrate treated to recover U and then ammoniated, and the ammoniated material dried and granulated to produce a nitric phosphate fertilizer were continued. (J.E.D.)

2260 RMO-2710

Tennessee Valley Authority, Wilson Dam, Ala.

UTILIZATION OF FLORIDA LEACH ZONE MATERIAL. Progress Report for January 1953. Feb. 16, 1953. Decl. Nov. 28, 1955. 12p. $1.80(ph OTS); $1.80(mf OTS).

The application of flotation techniques to the tailing from the wet grinding process is described. The work includes tests of the effect of primary calcination of the ore on its beneficiation by dry grinding. The phosphate was floated from the quartz gangue in a series of tests with a fatty acid collector. The quartz was floated from the phosphate in another series with an amine collector. The collectors were added stepwise, and the floating material was re-moved after each addition. The results of the most effective test with each type of collector are summarized. The products are listed in the order of decreasing contents of P_2O_5 and U. Studies were continued of the process in which unbeneficiated leach zone ore is extracted with nitric acid, the extraction filtrate is first treated to recover U and then ammoniated, and the ammoniated material is dried and granulated to produce a nitric phosphate fertilizer. (J.E.D.)

2261 RMO-2715

Tennessee Valley Authority, Wilson Dam, Ala.

UTILIZATION OF FLORIDA LEACHED ZONE MATERIAL. Progress Report for June 1953. July 17, 1953. Decl. Nov. 28, 1955. 18p. $3.30(ph OTS); $2.40(mf OTS).

A brief summary of the progress of the work of the research and development branch is reported. Leached zone phosphate ores were examined microscopically. The ores selected for study differed primarily in the per-centages of U, Al_2O_3 and P_2O_5 present. Pilot-plant tests of the production of nitric phosphate fertilizer from the Florida leached zone ore were continued. In this process the ore was calcined and extracted with HNO_3. Uranium was recovered from the filtrate by a solvent extraction process. (J.E.D.)

2262 RMO-2716

Tennessee Valley Authority, Wilson Dam, Ala.

UTILIZATION OF FLORIDA LEACHED ZONE MATERIAL. Progress Report for July 1953. Aug. 18, 1953. Decl. Nov. 28, 1955. 29p. $4.80(ph OTS); $2.70(mf OTS).

A summary of the work of the research and development branches is given. Leached zone ore was beneficiated by washing, grinding, and classification to provide raw material for the leached zone pilot plant. Pilot plant tests of the production of nitric phosphate fertilizer from the Florida leached zone ore were reported. (For preceding period see RMO-2715.) (J.E.D.)

2263 RMO-2719

Tennessee Valley Authority, Wilson Dam, Ala.

UTILIZATION OF FLORIDA LEACHED ZONE MATERIAL. Progress Report for October 1953. Oct. 29, 1953. Decl. Nov. 28, 1955. 14p. $3.30(ph OTS); $2.40(mf OTS).

In the process for the production of nitric phosphate fertilizer from the Florida leached zone material, the ore was calcined and then extracted with HNO_3 and H_2SO_4. The U was recovered from the filtrate by solvent extraction. The filtrate was then ammoniated, granulated, and dried. Pilot plant tests indicated that one-stage ammoniation in the production of high-alumina nitric phosphates of rel-atively high water-soluble P_2O_5 content was not satis-factory because the slurry thickened to the extent that it

could not be agitated satisfactorily and would not flow
freely. Laboratory study of the ammoniation step in the
process showed that the water-soluble P_2O_5 content varied
with changes in the conditions of ammoniation, with
changes in the pH at which ammoniated slurries were
allowed to stand at room temperature before drying, and
with changes in the time of drying the product. From
laboratory experiments it was concluded that alkaline ex-
traction of leached zone ore has no particular advantage
over HNO_3 extraction. (J.E.D.)

2264   RMO-2720
Tennessee Valley Authority, Wilson Dam, Ala.
UTILIZATION OF FLORIDA LEACHED ZONE MATERIAL.
Progress Report for November 1953. Nov. 27, 1953.
Decl. Nov. 28, 1955. 15p. $3.30(ph OTS); $2.40(mf OTS).

Further studies are reported on the factors that in-
fluence the solubility of the phosphates in precipitates
formed upon ammoniation and drying of simulated acid
extracts of leached zone ore. Aqueous and gaseous
ammonia were used as ammoniation agents. Pilot plant
tests of the production of nitric phosphate fertilizer from
Florida leached ore are reported. In the process the ore
is calcined and extracted with HNO_3 and H_2SO_4. The U is
recovered from the filtrate by a solvent extraction. The
filtrate is then ammoniated, granulated, and dried. (For
preceding period see RMO-2719.) (J.E.D.)

2265   RMO-2722
Tennessee Valley Authority, Wilson Dam, Ala.
UTILIZATION OF FLORIDA LEACHED ZONE MATERIAL.
Progress Report for January 1954. Jan. 28, 1954. Decl.
Nov. 28, 1955. 19p. $3.30(ph OTS); $2.40(mf OTS).

Nitric phosphate fertilizer was produced from the
Florida leached zone material by calcining the ore and
extracting with HNO_3 and H_2SO_4. The U was recovered by
solvent extraction. The filtrate was then ammoniated,
granulated, and dried. Pilot-plant tests indicated that
calcined beneficiated high-Ca ore could be processed to
produce a 1 : 2 : 1 ratio nitric phosphate fertilizer by the
procedure used with calcined unbeneficiated ore. Pre-
liminary operation of the pilot-plant U recovery unit was
resumed using a solution of tributyl phosphate in kerosene
as the organic solvent. Stripping of the U from the organic
with a dilute solution of H_2SO_4 was very poor. Bench-
scale tests indicate that stripping of the organic can be
improved by heating the stripping tanks. (For preceding
period see RMO-2721.) (J.E.D.)

2266   RMO-2724
Tennessee Valley Authority, Wilson Dam, Ala.
UTILIZATION OF FLORIDA LEACHED ZONE MATERIAL.
Progress Report for March 1954. March 30, 1954. Decl.
Nov. 28, 1955. 21p. $3.30(ph OTS); $2.40(mf OTS).

In a pilot plant extraction and filtration test using 1 lb
of HNO_3 and 1.5 lb of H_2SO_4 per lb of P_2O_5 in the ore, 97%
of the P_2O_5 was solubilized and only 4% of the P_2O_5 was
lost as soluble P_2O_5 in the filter cake. About the same
results were obtained for U. Factors which may have
contributed to the high recovery are discussed. Bench-
scale tests of drying ammoniated slurry at 200°F in-
dicated that the loss of N was excessive when the H of the
slurry was 8.5 but little or no N was lost at a pH of 5 or
6. About 30% of the P_2O_5 in the dried product was water-
soluble when filtrate made with 1 lb of HNO_3 and 1.5 lb of
H_2SO_4 per lb of P_2O_5 was ammoniated to a pH of 6. About

90% of the U was recovered from the extraction filtrate
using TBP as a solvent. The U in the TBP was precipitated
with ammonia. (J.E.D.)

2267   Y-462
Carbide and Carbon Chemicals Corp. Y-12 Plant,
    Oak Ridge, Tenn.
THE PRODUCTION AND CONSUMPTION OF HCl IN
THE ACID PROCESS FOR CARNOTITE. K. B. Brown
and G. H. Clewett. Feb. 21, 1950. Decl. Dec. 6, 1955.
Contract W-7405-Eng-26. $6.30(ph OTS); $3.00(mf OTS).

Factors which affect the production and consumption of
HCl in the acid process are described. Reasons for the
different effects are given and their importance to the
over-all process are discussed. (auth)

2268   Y-475
Carbide and Carbon Chemicals Corp. Y-12 Plant,
    Oak Ridge, Tenn.
A STUDY OF ZIRCONIUM COMPLEXING AGENTS.
D. A. Lee, J. S. Drury, and R. W. Woodard. Aug. 30,
1949. Decl. Dec. 6, 1955. 12p. Contract W-7405-
Eng-26. $3.30(ph OTS); $2.40(mf OTS).

An investigation of eleven organic complexing agents in
connection with their action on Zr is reported. Results in-
dicate ammonium thiocyanate to be the most promising of
the complexes examined. Discussion of procedure is given.
(J.E.D.)

ANALYTICAL PROCEDURES

2269   A-1511
Purdue Univ., Lafayette, Ind.
THE QUANTITATIVE DETERMINATION OF CHLORINE
AND FLUORINE IN POLYHALO ORGANIC COMPOUNDS.
E. T. McBee. Aug. 25, 1944. Decl. Dec. 7, 1955. 9p.
Contract W-7405-eng-74. $1.80(ph OTS); $1.80(mf OTS).

An investigation to develop a procedure for the
complete decomposition of a polyhalo compound and
subsequent determination of its chlorine and fluorine
content has been completed. The polyhalo compound is
decomposed by reduction with sodium in liquid ammonia.
The reaction is carried out at room temperatures in a
sealed glass tube. After decomposition, the excess sodium
is decomposed with ethyl alcohol and the products
dissolved in distilled water. The solution is aliquoted if
fluorine is present. If the color of the solution is too
dark, the color is destroyed by boiling the alkaline
solution with hydrogen peroxide. Chlorine is determined
by the Vollhard method using nitrobenzene to coagulate
and to remove silver chloride from the reaction medium
after addition of excess standard silver nitrate. Fluorine is
determined indirectly by a modification of Hawley's
method. Lead chlorofluoride is precipitated from the
solution by a carefully controlled procedure, the pre-
cipitated from the solution by a carefully controlled
procedure, the precipitate filtered, dissolved in dilute
nitric acid and the chloride in solution titrated by the
Vollhard method. The fluorine content is calculated from
the chlorine–fluorine ratio of lead chlorofluoride. (auth)

2270   A-2711
Purdue Research Foundation, Lafayette, Ind. and Purdue
    Univ., Lafayette, Ind.
POTENTIOMETRIC TITRIMETRIC DETERMINATION OF

URANIUM USING POTASSIUM DICHROMATE. Analytical Report. W. S. Barnhart, E. S. Gantz, T. DeVries, and M. G. Mellon. Mar. 8, 1946. Decl. Dec. 8, 1955. 10p. Contract W-7405-eng-74. $3.30(ph OTS); $2.40(mf OTS).

A potentiometric procedure for the precise determination of uranium has been developed. Solutions containing uranium and 0.5M in sulfuric acid which are free of nitrates and organic matter are purified and the uranium reduced by use of a mercury-cathode diaphragm cell. The uranium(III) is air oxidized to uranium(IV), the potential change being followed potentiometrically to prevent over-oxidation. The final potentiometric titration with standard potassium dichromate is done at room temperature in the presence of ferric ion. Using a water-jacketed chamber-buret, a precision of 1 part in 2000 has been obtained. Moderate amounts of chromic, cupric, nickelous and chloride ions do not interfere. (auth)

2271 A-2712

Purdue Research Foundation, Lafayette, Ind. and Purdue Univ., Lafayette, Ind.

THE DETERMINATION OF URANIUM BY METALLIC ZINC REDUCTION-DICHROMATE TITRATION. Analytical Report. A. M. Ribley, M. G. Mellon, H. Hunt, T. DeVries, and E. S. Gantz. Mar. 8, 1946. Decl. Dec. 8, 1955. 7p. Contract W-7405-eng-74. $1.80(ph OTS); $1.80(mf OTS).

A method is described for the titrimetric determination of U. The sample solution containing about 5g of U is freed of nitrates by evaporation to dryness and ignition to the mixed oxides. It is then redissolved in dilute H_2SO_4 and 30% H_2O_2. Purification of the sample is carried out by electrolysis for one or more hours at 12 volts and 2 or more amperes in a mercury cathode cell. The sample, after dilution with distilled water, is aliquoted giving samples containing about 0.5g U. These small samples are reduced in a covered 125-ml Erlenmeyer flask with granulated Zn and concentrated HCl. After the U(III) is air oxidized (endpoint by Pt—W electrode system), the U is determined by titration with $K_2Cr_2O_7$ solution. Iron remaining in the purified sample is determined colorimetrically and the appropriate correction applied. This method is rapid and gives very precise and accurate results. (auth)

2272 A-2903

Madison Square Area, Manhattan District, New York.

ANALYTICAL INFORMATION REPORT FOR THE PERIOD JUNE 1-30, 1945. July 1, 1945. Decl. Dec. 14, 1955. 14p. $3.30(ph OTS); $2.40(mf OTS).

Conductivity measurements of $UO_2(NO_3)_2 \cdot 6H_2O$ and $UO_2(NO_3)_2 \cdot 2H_2O$ in ethyl ether were made. Procedures are described for the determination of B in NaOH and Na_2CO_3 and the determination of U and V in vanadium-containing plant liquors. (C.W.H.)

2273 A-4017

Kellex Corp., New York.

THE COLORIMETRIC DETERMINATION OF URANYL ION WITH POTASSIUM FERROCYANIDE. Robert H. Lafferty, Jr., Troy J. McCormick, and Herbert Myers. Apr. 1, 1946. Decl. Dec. 8, 1955. 10p. (D21). $1.80 (ph OTS); $1.80(mf OTS).

A colorimetric method is described for the determination of uranyl ion. Potassium ferrocyanide is used as the reagent for the development of color in a solution buffered with sodium formate—formic acid. (C.H.)

2274 A-4022

Kellex Corp., New York.

A MICRO METHOD FOR THE DETERMINATION OF GASEOUS FLUORIDE. K. J. Radimer, S. H. Smiley, and R. H. Lafferty, Jr. Apr. 1, 1946. Decl. Dec. 7, 1955. 16p. $3.30(ph OTS); $2.40(mf OTS).

A micro method is described for the quantitative determination of potentially ionizable fluorine in gases. From 1 to 500 ppm by volume of F, or equivalent quantities of other gaseous fluorides, can be determined with an accuracy of about 10%. The determination is unique in that production of color is used instead of a bleaching effect or a change of color. (C.H.)

2275 A-4028

[Kellex Corp., New York.]

A COLORIMETRIC DETERMINATION OF C616 [C_6F_{16}] AND TO$_2$F$_2$ [UO_2F_2] WITH 8-HYDROXYQUINOLINE. Joseph Greenspan, Mathias J. Schuler, and Harry Goldenberg. July 15, 1944. Decl. Dec. 5, 1955. 6p.

A colorimetric method employing 8-hydroxyquinoline for the determination of U and traces of C_6F_{16} (15 to 375 ug/ml) is described. (C.W.H.)

2276 A-4174

Carbide and Carbon Chemicals Corp., Oak Ridge, Tenn.

ON THE PRECISION OF A METHOD OF T [URANIUM] ANALYSIS. N. Heerema and G. A. Garrett. May 9, 1947. Decl. Dec. 10, 1955. 10p. [Contract W-7405-eng-26]. (K-2.19.10). $1.80(ph OTS); $1.80(mf OTS).

The dependence of U analysis precision on several available analytical variables are shown, and an estimate of the maximum attainable precision is made. The method of analysis provides a precision of from ± 0.025% to ± 0.05% U present in samples containing approximately 67% U. (J.E.D.)

2277 AECD-3790

Knolls Atomic Power Lab., Schenectady, N. Y.

HYDROGEN PEROXIDE ANALYSIS AND DECOMPOSITION IN CHROMATE SOLUTIONS. J. Rynasiewicz and J. W. Ryan. Mar. 17, 1952. Decl. with Deletions Dec. 5, 1955. 24p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70 (mf OTS).

A novel procedure employing ion exchange resins was developed to separate chromate ions from hydrogen peroxide, permitting the subsequent analysis of peroxide to determine its decomposition in sodium chromate solutions. At high pH's, peroxide was adsorbed anionically on the ion exchange resins along with chromate. By selecting a resin which would be effective at nearly neutral conditions, chromate was satisfactorily separated from peroxide. It was found that the rate of peroxide decomposition in slightly alkaline sodium chromate solutions was dependent on temperature, pH, aeration, and chromate concentration. No significant effect on decomposition was caused by visible light. (auth)

2278 AECD-3811

Mound Lab., Miamisburg, Ohio.

URINE ASSAY PROCEDURE AT THE MOUNT LABORA-TORY. Final Report. E. S. Spoerl. Apr. 14, 1950. Decl. with deletions Dec. 7, 1955. 31p. Contract AT-33-1-GEN-53. $6.30(ph OTS); $3.00(mf OTS).

A method is described for the radiometric determination of α particles from Po in urine samples. Details of

the preparation of samples for counting are included. A permissible limit of 500 d/min/24-hr urine sample corresponding to 8 c/m/50 ml of urine was assumed. (C.H.)

2279   AECD-3825

Kellex Corp., New York.
THE DETECTION OF SMALL AMOUNTS OF FLUORINE IN LARGE AMOUNTS OF CHLORINE. Robert H. Lafferty, Jr., and Rasho Winget. Apr. 1, 1946. Decl. with deletions Dec. 7, 1955. 7p. $1.80(ph OTS); $1.80(mf OTS).

Tests are described for both the qualitative detection and the quantitative determination of fluorine in chlorine. The qualitative test is made by passing the gas through manganous chloride. If the pink solid turns brown there is greater than 0.5% of fluorine in the gas. The quantitative test is a modification of the Stiger and Merwin test using oxidized Ti solution. (C.H.)

2280   AECD-3829

Oak Ridge National Lab., Y-12 Area, Tenn.
EFFECT OF pH AND CONCENTRATION OF AMMONIUM PERSULFATE ON COLORIMETRIC DETERMINATION OF NICKEL BY DIMETHYLGLYOXIME METHOD. J. C. White. July 30, 1952. Decl. with deletions Dec. 6, 1955. 7p. $1.80(ph OTS); $1.80(mf OTS).

An investigation was made of the effect of pH and concentration of ammonium persulfate on the colorimetric determination of Ni by the dimethylglyoxime method. Recommendations are made for improving results in this determination. (C.H.)

2281   AECD-3836

National Bureau of Standards, Washington, D. C.
A COLORIMETRIC DETERMINATION FOR TRACES OF CADMIUM IN U_3O_8 RESIDUES. A. Schwebel and H. Rosenwasser. Nov. 1948. Decl. with deletions Dec. 7, 1955. 7p. $1.80(ph OTS); $1.80(mf OTS).

A method is described for the colorimetric determination of trace amounts of Cd in U_3O_8 residues. Dithizone was the reagent used to produce the color. (C.H.)

2282   AECD-3845

Los Alamos Scientific Lab., N. Mex.
THE DETERMINATION OF INDIUM IN INDIUM PLUTONIUM SOLUTIONS. Glenn R. Waterbury. Dec. 12, 1950. Decl. with deletions Dec. 13, 1955. 20p. Contract W-7405-eng-36. $3.30(ph OTS); $2.40(mf OTS).

A gravimetric procedure is described for the analysis of In–Pu solutions. This procedure consists of a preliminary separation of the Pu as the peroxide, followed by the quantitative precipitation of In diethyl dithio carbamate from a slightly acid solution. The precipitate is dried at 105°C and weighed. Recoveries of 99.4 to 100.5% with an average precision of 2.3/1000 were obtained on known Pu–In solutions containing 5 to 50 mg of In per sample. (auth)

2283   ANL-4769

Argonne National Lab., Lemont, Ill.
FOUNDRY MELT CONTROL OF LITHIUM–ALUMINUM ALLOYS BY NEUTRON TRANSMISSION. A. M. Howard, R. A. Noland, and C. O. Muehlhause. Jan. 1952. Decl. Dec. 9, 1955. 14p. Contract W-31-109-eng-38. $3.30(ph OTS), $2.40(mf OTS).

A study was made of the determination of Li by the absorption of a neutron beam obtained from a radium–beryllium source. It was observed that a Li–Al alloy

system appeared to be adaptable for Li determination by this means. (J.E.D.)

2284   BMI-97

Battelle Memorial Inst., Columbus, Ohio.
SPECTROPHOTOMETRIC DETERMINATION OF SMALL AMOUNTS OF URANIUM IN PHOSPHATE ROCK, SHALES AND SIMILAR MATERIALS. E. J. Center. May 1, 1947. Decl. Dec. 9, 1955. 19p. Contract W-38-094-eng-27. $4.80(ph OTS); $2.70(mf OTS).

Procedures are given for sample decomposition and the determination of small amounts of U (down to 0.001%) in the phosphate rocks and shales. The cupferron and ether-extraction methods are discussed including the method of spectrophotometric measurement employing two wave lengths. Comparison of results by various methods is given. (auth)

2285   CC-1432

Clinton Labs., Oak Ridge, Tenn.
DETERMINATION OF FREE NITRIC ACID IN UNH SOLUTIONS. PROBLEM ASSIGNMENT NO. 208-X2A. Progress Report. A. K. Parlour. Apr. 21, 1944. Decl. Dec. 12, 1955. 8p. (A-2263) $1.80(ph OTS); $1.80(mf OTS).

The titration of free nitric acid in dissociated UNH is accomplished by removing U from solution with potassium ferrocyanide and titrating the residual acid directly with a standard base using methyl red or phenolphthalein indicators. An error of less than 4% may be obtained. A method is given to determine formic acid when present in such a mixture. (K.S.)

2286   CF-45-6-144

[Oak Ridge National Lab., Tenn.]
COMMENTS ON THE URINE ANALYSIS RESULTS ON CLINTON LABORATORIES PERSONNEL AS REPORTED BY CHICAGO. S. G. English. June 12, 1945. Decl. Dec. 3, 1955. 7p. $1.80(ph OTS); $1.80(mf OTS).

A statistical analysis was made of results in the radiometric analysis of urine samples. Comments are included on possible reasons for variations in the urine analysis results based only on considerations of counting. (C.H.)

2287   CF-52-2-72

Oak Ridge National Lab., Tenn.
A METHOD FOR THE ANALYSIS OF NITROGEN TETROXIDE IN DISSOLVER OFF-GASES; Quarterly Report [for] Period November 10, 1951–February 10, 1952. L. E. Line, Jr. Feb. 12, 1952. Decl. Dec. 15, 1955. 11p. $3.30(ph OTS); $2.40(mf OTS).

A method is described for the colorimetric determination of nitrogen trioxide in dissolver off-gases in the Purex Process. The method is applicable to the analysis of $N_2O_4(NO_2)$ in concentrations ranging downward from 1 to 2% to less than 100 ppm in the gas stream, and was found applicable to NO upon conversion to N_2O_4. Griess reagent, used as the colorimetric reagent, was found to be sensitive to less than 0.01 ppm of nitrate in solution. (C.H.)

2288   HW-7737

[Hanford Works, Richland, Wash.]
CALCULATION OF END POINTS IN POTENTIOMETRIC ANALYSES. C. A. Bennett. Oct. 6, 1947. Decl. Dec. 2, 1955. 6p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

Two methods are described for determining the end point

of a potentiometric titration, neither of which requires the plotting of a graph. Both depend on the use of a constant increment in the neighborhood of the end point, and may be applied where a more sensitive method than that of maximum difference is required yet the plotting of titration curves for each determination is impractical. (C.H.)

2289   HW-13301
Hanford Works, Richland, Wash.
THE COULOMETRIC DETERMINATION OF ACETIC ACID. William N. Carson, Jr. and Roy Ko. Aug. 16, 1949. Decl. Dec. 2, 1955. 7p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

Small amounts of acetic acid, equivalent to 400μl of 0.3 to 0.13 g/l, can be titrated coulometrically in the presence of a 10 to 25-fold excess of HNO_3 in 70% isopropanol. An accuracy of ± 0.1% and a precision of ± 8.5% (99% limits) are obtained. (auth)

2290   HW-14226
Hanford Works, Richland, Wash.
A RAPID COLORIMETRIC METHOD FOR THE DETERMINATION OF PHOSPHATE IN URANIUM WASTE SOLUTIONS. C. A. Sege and C. H. Ice. Aug. 22, 1949. Decl. Dec. 2, 1955. 5p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

A colorimetric method, which is a modification of the classical phosphomolybdic acid method, has been developed for the determination of phosphate in synthetic U waste solutions. The method is based upon the fact that, at high acidities, phosphomolybdic acid is reduced by stannous chloride to a stable blue compound while molybdic acid is not appreciably reduced in this way to molybdenum blue. The reduction product shows a maximum absorption at a wave length of 725 mμ and the intensity varies with phosphate concentration according to Beer's Law. Nitrates, above a known concentration, oxidize the blue compound giving rise to low results. The method will not tolerate the presence of As, Ge, or Si. A high degree of precision has been obtained in the analysis of routine samples and an accuracy of five % was achieved on known samples. (auth)

2291   HW-15044
Hanford Works, Richland, Wash.
POLAROGRAPHIC DETERMINATION OF HEXONE. George J. Alkire. Nov. 10, 1949. Decl. Dec. 5, 1955. 6p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

A method was established for the determination of 0.04 to 20 g/l hexone with a precision of ± 4.0%. Hexone is first stripped from the aqueous phase with a stream of nitrogen and is collected in an acidified solution of hydrazine. Hydrozone is formed by reaction between hydrazine and hexone and is determined polarographically. (auth)

2292   HW-17046
Hanford Works, Richland, Wash.
THE COULOMETRIC DETERMINATION OF ACID. W. N. Carson, Jr. and Roy Ko. Mar. 1, 1950. Decl. Dec. 2, 1955. 6p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

The use of electrolytically generated base is reported to be feasible for acid titrations by coulometric methods of analysis. In general, those solutions which can be titrated with standard solutions can also be titrated coulometrically. Precision and accuracy for micro-

samples are as good or better than those obtained by use of burets and standard solutions. In addition, a direct reading for the determination can be obtained and the apparatus is easily adapted to remote control. Preliminary work has indicated that generation of acid for base titration is also feasible. (auth)

2293   HW-18146
Hanford Works, Richland, Wash.
DETERMINATION OF RADIOCESIUM WITH CHLOROPLATINIC ACID. R. E. Ewing. June 22, 1950. Decl. Dec. 7, 1955. 17p. Contract W-31-109-eng-52. $3.30 (ph OTS); $2.40(mf OTS).

A forty-five minute method for the determination of radiocesium has been developed. The Cs carrier and activity are precipitated from an acid solution with chloroplatinic acid after scavenging the sample solution with $Fe(OH)_3$ to remove most of the other fission product activities. The Cs precipitate is mounted on a brass disk by slurrying the precipitate with alcohol into a disk holder with the disk secured at the bottom. The alcohol is evaporated from the slurry leaving an evenly distributed layer of precipitate on the disk. The β particle emitted by the active Cs is counted with a Geiger counter. A distance of 2.15 cm is used between the sample and the window of the counting chamber. Corrections are made for carrier recovery and absorption and backscattering effects. (auth)

2294   HW-22680
Hanford Works, Richland, Wash.
THE APPLICATION OF NUCLEAR TRACK EMULSIONS TO THE ANALYSIS OF URINE FOR VERY LOW LEVEL PLUTONIUM. L. C. Schwendiman, J. W. Healy, and D. L. Reid. Nov. 15, 1951. Decl. Dec. 2, 1955. 45p. Contract W-31-109-Eng-52. $7.80(ph OTS); $3.30 (mf OTS).

An analysis for Pu in urine has been developed which uses nuclear track film for evaluation of the quantity of separated plutonium. Trace amounts of the element are removed by a TTA extraction followed by electrodeposition onto a stainless steel disc with a circular area of deposition of 38.5 mm^2. The discs are held in contact with nuclear track alpha plates for one week, the plates are processed, and the number of tracks from the alpha particles are counted with a microscope using 430x magnification. Emulsion background tracks are reduced to 0.002 d/m for the source area by eradication prior to use. Fixtures for exposing the sources are described and conditions for exposure and film processing are discussed. Techniques and fixtures to facilitate track reading are described. Data are presented for a period of semi-routine operation of the process in the Bioassay Laboratory of the Radiological Sciences Department. Recovery of more than 95% of the Pu in spiked urine samples is reported, and a detection limit at the 99% confidence level is shown to be approximately 0.1 d/m per 24 hour sample. An interpretation of this detection limit in terms of the fate of plutonium in the body suggests that doses of any consequence will be detected even after long periods of chronic exposure. (auth)

2295   LA-507
Los Alamos Scientific Lab., N. Mex.
MICROVOLUMETRIC ASSAY OF PLUTONIUM. H. E. Boaz. May 10, 1946. Decl. Dec. 13, 1955. 17p. Contract

[W-7405-eng-36]. $3.30(ph OTS); $2.40(mf OTS).

Plutonium sulfate in $2\underline{N}$ H_2SO_4 is reduced to the 3^+ valence with zinc amalgam under a CO_2 atmosphere, and is titrated potentiometrically to the 4^+ valence with ceric sulfate. An accuracy of 0.1% is obtained in the range of 2 to 10 mg. (auth)

2296   LA-696
Los Alamos Scientific Lab., N. Mex.
COLORIMETRIC DETERMINATION OF BORON IN BERYLLIUM METAL AND BERYLLIUM OXIDE. Glenn R. Waterbury. July 29, 1948. Decl. Dec. 10, 1955. 22p. $4.80(ph OTS); $2.70(mf OTS).

A colorimetric procedure for the determination of submicrogram quantities of B in Be and BeO is discussed. The advantages of using HCl, H_2SO_4, and H_3PO_4 with Be samples are compared. (C.W.H.)

2297   LA-703
Los Alamos Scientific Lab., N. Mex.
THE DETERMINATION OF NICKEL, IRON AND CHROMIUM IN MERCURY. K. S. Bergstresser. Aug. 27, 1948. Decl. Dec. 10, 1955. 12p, $3.30(ph OTS); $2.40 (mf OTS).

The separation and colorimetric determination of Ni, Fe, and Cr in Hg are described. The corrosion of stainless steel by Hg was investigated. (C.W.H.)

2298   LA-738
Los Alamos Scientific Lab., N. Mex.
A COMBUSTION METHOD FOR THE DETERMINATION OF CARBON IN CALCIUM METAL. Edward H. Van Kooten. June 6, 1949. Decl. Dec. 13, 1955. 20p. [Contract W-7405-eng-36.] $3.30(ph OTS); $2.40(mf OTS).

Calcium metal can be quantitatively analyzed for carbon by burning in moist O_2 for 1 hr. at 1425°C and collecting and weighing the CO_2 formed. (C.W.H.)

2299   LA-739
Los Alamos Scientific Lab., N. Mex.
EFFECT OF PLUTONIUM ON COLORIMETRIC IRON ANALYSIS. Karl S. Bergstresser. June 7, 1949. Decl. Dec. 14, 1955. 13p. Contract [W-7405-eng-36]. $1.80 (ph OTS); $1.80(mf OTS).

The interference of Pu in the colorimetric analysis of Fe with o-phenanthroline has been quantitatively determined. Using Fe-free Pu, the extinction coefficient varies between 0.078 and 0.038 ml/mg when the Pu concentration in a 10 ml sample is changed from 0.1 to 0.8 mg/ml. The extinction coefficient for Fe is 2 to 4000 times greater than that for Pu. (auth)

2300   LA-1128
Los Alamos Scientific Lab., N. Mex.
A NEW MICRO COMBUSTION METHOD FOR CARBON IN PLUTONIUM. William G. Smiley. July 6, 1950. Decl. Dec. 13, 1955. 27p. Contract W-7405-eng-36. $4.80 (ph OTS); $2.70(mc).

The capillary trap, resistance furnace for induction heating, and use of O_2 at atmospheric pressure are main alterations in a modified combustion method for the determination of carbon in Pu. (C.W.H.)

2301   LA-1197
Los Alamos Scientific Lab., N. Mex.
A SPECTROPHOTOMETRIC DETERMINATION OF MULTI-MICROGRAM AMOUNTS OF PLUTONIUM. Glendall L. King. Jan. 26, 1951. Decl. Dec. 13, 1955. 23p. Con-

tract W-7405-eng-36. $4.80(ph OTS); $2.70(mf OTS).

A spectrophotometric method for the determination of Pu using sodium alizarinsulfonate has been developed. The red Pu-alizarinsulfonate color is developed in solutions having a pH of about 3 in the presence of a formic acid—sodium formate buffer, and the resulting absorption is measured at 530 mμ. Most interfering cations, particularly Fe^{3+}, are removed from the Pu solutions by means of electrolysis using a mercury cathode. Al^{3+}, in quantities up to 3% of the Pu content, may be tolerated in this procedure. Chloride and nitrate ions produce no interference over the concentration range studied, while tartrate, citrate, oxalate, and fluoride ions cause low results. (auth)

2302   LA-1345
Los Alamos Scientific Lab., N. Mex.
THE POLAROGRAPHIC DETERMINATION OF TITANIUM IN PLUTONIUM SOLUTIONS. Maynard E. Smith. Dec. 20, 1951. Decl. Dec. 12, 1955. 27p. $4.80(ph OTS); $2.70(mf OTS).

A polarographic procedure for the determination of Ti in Pu solutions of Ti/Pu weight ratios as low as 0.128 has been devised. (auth)

2303   M-4534
[Ames Lab., Ames, Iowa.]
THE DETERMINATION OF IRON IN THORIUM METAL. (AMES PROCEDURE). [nd]. Decl. Nov. 29, 1955. 5p. $1.80(ph OTS); $1.80(mf OTS).

A spectrophotometric procedure is outlined for the determination of Fe in Th metal. This procedure is based on the absorbancy of the Fe-phenanthroline complex. (C.W.H.)

2304   NBS-202
National Bureau of Standards, Washington, D. C.
A RAPID COLORIMETRIC METHOD FOR THE DETERMINATION OF URANIUM U_3O_8. A. Schwebel. Nov. 1948. Decl. Dec. 5, 1955. 3p. $1.80(ph OTS); $1.80(mf OTS).

A colorimetric method for the determination of U_3O_8 based on the color developed by means of H_2O_2 is outlined. (auth)

Refer also to abstracts 2352, 2371, 2388, and 2392.

DEUTERIUM AND DEUTERIUM COMPOUNDS

2305   A-149
Princeton Univ., N. J.
THE HYDROGEN—WATER VAPOR EXCHANGE REACTION ON METAL CATALYSTS. Progress Report. Mar. 10, 1942. Decl. Dec. 6, 1955. 9p. $1.80(ph OTS); $1.80(mf OTS).

The velocity of the exchange reaction, $H_{2(g)} + HDO_{(g)} = H_2O_{(g)} + HD_{(g)}$, was measured in the forward and reverse directions, at 56.5, 64.5 and 80°C using metallic catalysts of Pt and Ni. Equilibrium conversions are attainable in either direction at space velocities of H_2 up to 60000, on Pt catalysts, at the several temperatures. Nickel catalysts are inferior to Pt catalysts but yield equilibrium at space velocities of H_2 1000-fold greater than the half-conversion space velocities obtainable with the hydrogen—liquid water systems at atmospheric pressure. Two-stage operation of the vapor phase equilibrium

with a water vapor—hydrogen ratio of 1 to 5 at 60000 hydrogen space velocity and 56.5°C can remove 90% of the HD content of a gas containing 2.5% of HD. (auth)

2306 BNL-143

Brookhaven National Lab., Upton, N. Y.

PLATE EFFICIENCY IN THE EXCHANGE OF DEUTERIUM BETWEEN AMMONIA AND HYDROGEN. Morris L. Perlman and Jacob Bigeleisen. Dec. 3, 1951. Decl. Dec. 3, 1955. 7p. $1.80(ph OTS); $1.80(mf OTS).

Data on Murphree plate efficiencies under flow conditions comparable with those considered for the production of deuterium by the exchange of D between ammonia and H are given. (C.H.)

2307 BNL-146

Brookhaven National Lab., Upton, N. Y.

THE CONCENTRATION OF DEUTERIUM BY CHEMICAL EXCHANGE BETWEEN HYDROGEN AND AMMONIA. J. Bigeleisen and M. L. Perlman. Dec. 15, 1951. Decl. Dec. 6, 1955. 5p. Contract [AT-30-2-GEN-8]. $1.80 (ph OTS); $1.80(mf OTS).

A process is described for the production of deuterium using the exchange of hydrogen between hydrogen gas and liquid ammonia. (C.H.)

2308 BNL-156

Brookhaven National Lab., Upton, N. Y.

AN EVALUATION OF THE FEASIBILITY OF UTILIZING THE EXCHANGE OF HYDROGEN BETWEEN PHOSPHINE AND WATER FOR THE PRODUCTION OF D_2O. J. Bigeleisen and R. E. Weston, Jr. Feb. 1952. Decl. Dec. 5, 1955. 5p. $1.80(ph OTS); $1.80(mf OTS).

The relative efficiencies of the H_2S-H_2O and PH_3-H_2O systems when operated in a set of dual-temperature columns were evaluated from the equilibria $HDS_{(g)} + H_2O_{(g)} = H_2S + HDO_{(g)}$ and $PH_2D_{(g)} + H_2O_{(g)} = PH_{3(g)} + HDO_{(g)}$. Advantages of the two systems are discussed. (C.W.H.)

FLUORINE AND FLUORINE COMPOUNDS

2309 A-748

Du Pont de Nemours (E. I.) & Co. Jackson Lab., Wilmington, Del.

EXPERIMENTAL PRODUCTION OF FLUORINE. Problem Report. W. S. Calcott. June 28, 1943. Decl. Dec. 8, 1955. 20p. (100XR-1466). $3.30(ph OTS); $2.40(mf OTS).

Results are summarized from an investigation of the performance of various grades of graphitic and non-graphitic C anodes in the electrolytic production of F. The corrosion resistance was determined for steel, Cu, brass, bronze, monel, Ni, inconel, Al, Mg, and nichrome to the electrolyte and to the liberated F. Data are tabulated. (C.H.)

2310 A-888

Purdue Univ., Lafayette, Ind.

PROGRESS REPORT ON FLUOROCARBON RESEARCH AT PURDUE UNIVERSITY. E. T. McBee. June 4, 1943. Decl. Nov. 29, 1955. 32p. Contract W-7405-eng-74. $6.30(ph OTS); $3.00(mf OTS).

The chlorination of normal heptane is reported. Experimental results are presented from studies on the fluorination of polychloroheptanes with HF at atmospheric and at super-atmospheric pressures, and the fluorination of polychloropolyfluoroheptanes with SbF_5 at atmospheric and super-atmospheric pressure and with silver difluoride at atmospheric pressure. (C.H.)

2311 A-2588

Du Pont de Nemours (E.I.) & Co. Jackson Lab., Wilmington, Del.

CHAMBERS WORKS PROCESS FOR THE MANUFACTURE OF LIQUID PHASE CRUDE $C_{21}F_{44}$ AT BLUE PRODUCTS (M.W. 1088). E. P. Higgins. Jan. 12, 1945. Decl. Dec. 8, 1955. 10p. Contract W-7412-eng-2. (B.P.-22) $1.80 (ph OTS); $1.80(mf OTS).

The process for the production of crude $C_{21}F_{44}$ by the reaction of AgF_2 with $C_{21}H_{44}$ is described. Process yields (~ 63%) were obtained. (C.W.H.)

2312 A-3513

Du Pont de Nemours (E. I.) & Co. Jackson Lab., Wilmington, Del.

PRODUCTION OF COMPRESSED FLUORINE. DESIGN, INSTALLATION, PURIFICATION, LIQUEFACTION, COMPRESSION, AND ANALYSIS OF FLUORINE. Final Report. J. D. Compton. Feb. 11, 1946. Decl. Dec. 8, 1955. 45p. Contract W-7412-eng-151. (JWD-76) $9.30(ph OTS); $3.60(mf OTS).

Detailed information are presented on the liquefaction and compression of fluorine at 400 psi. Fluorine at cell pressure was passed through a carbon ice condenser and sodium fluoride scrubbers to reduce the HF content to below 0.5%. It was then condensed with liquid nitrogen to liquid fluorine, after which it was vaporized and compressed into cylinders under its own pressure. A small plant for the experimental production of elemental fluorine was operated successfully and sufficient information was developed to warrant the construction of a larger plant. This plant operated from Feb. 1944 until Nov. 1945. The total production of fluorine from both plants was 1796 lb. Data are included on plant design, equipment for the purification, liquefaction, and compression of fluorine, and the analysis of fluorine. (C.H.)

2313 A-3552

Du Pont de Nemours (E. I.) & Co. Jackson Lab., Wilmington, Del.

CHAMBERS WORKS PROCESS FOR THE MANUFACTURE OF FLUORINE AT THE BLUE PRODUCTS AREA CARBON ANODE CELLS (M. W. 38.0). E. B. Trepper. Jan. 22, 1945. Decl. Dec. 8, 1955. 9p. Contract W-7412-eng-2. (BP-35) $1.80(ph OTS); $1.80(mf OTS).

Procedures, specifications, and analytical methods are described for the production of fluorine. The method employs the electrolysis of a molten electrolyte having an approximate composition corresponding to the formula $KF \cdot 2HF$, containing LiF as a depolarizing agent. The F is liberated at a C anode, the H is liberated at a steel cathode, and a monel metal screen diaphragm between the two electrodes prevents mixing of the two gaseous products. A yield of 1 lb of F per 1.20 lb of HF fed to the cell is reported. (C.H.)

2314 A-3747

Purdue Research Foundation, Lafayette, Ind. and Purdue Univ., Lafayette, Ind.

PREPARATION OF CERTAIN POLYHALO COMPOUNDS. Summary Report for the Period May 1, 1943 to January 1, 1945. E. T. McBee. Decl. Dec. 8, 1955. 20p. Contract

W-7405-eng-74. $3.30(ph OTS); $2.40(mf OTS).

Investigations were continued on the preparation of C_7ClF_{15}, C_8H_{16}, fluorolube, and certain volatile fluorine-containing compounds. (C.W.H.)

Refer also to abstract 2325.

GRAPHITE

2315   HW-19284
Hanford Works, Richland, Wash.
FILLER BLOCK GRAPHITE SAMPLE REPORT. Final
Report [on] PRODUCTION TEST 105-329-P. P. A. Johnson.
Nov. 1, 1950. Decl. Dec. 7, 1955. 7p. Contract W-31-109-
Eng-52. $1.80(ph OTS); $1.80(mf OTS).

Since the data on graphite damage obtained from
controlled test samples is difficult to apply to some piles,
solid graphite samples were taken from Hanford reactor
filler layers. The removal was made during a normally
scheduled shutdown without exceeding normal operating
safety limitations. The removal procedure is discussed in
detail. (B.J.H.)

2316   NAA-SR-4
North American Aviation, Inc., Los Angeles.
STUDIES ON NUCLEAR REACTORS. 4. THEORY OF
IONIZATION AND ATOMIC DISPLACEMENT PRODUCED
BY FAST PARTICLES IN GRAPHITE. I. PRELIMINARY
CONSIDERATIONS. F. W. Brown. Feb. 1, 1948. Decl.
Dec. 6, 1955. 29p. (AL-329) $4.80(ph OTS); $2.70(mf
OTS).

The ionization and elastic energy transfer by charged
particles in graphite are considered in detail. Lattice dis-
placement effects are briefly discussed. The ionization
produced by protons, deuterons, alpha particles, carbon
atoms, and fission fragments in graphite is computed as a
function of energy by a semi-empirical method. The elastic
transfer effect is approximated by theoretical considera-
tions. Limitations and possible improvements of the theory
are discussed. (auth)

2317   NAA-SR-10
North American Aviation, Inc., Los Angeles.
STUDIES ON NUCLEAR REACTORS. 10. EXPERIMEN-
TAL METHOD FOR THE DETERMINATION OF RESISTIV-
ITY CHANGE IN GRAPHITE BOMBARDED WITH DEUTER-
ONS AND ALPHA PARTICLES. C. R. Malmstrom. Mar.
1, 1948. Decl. Dec. 6, 1955. 15p. (AL-333). $3.30(ph
OTS); $2.40(mf OTS).

Graphite, exposed to deuteron and alpha particle beams
in the 60-in. cyclotron at Berkeley, undergoes large
changes in electrical resistivity. The change is a function
of the exposure and of the distance along the path of the
particles. A new method of measuring the resistivity
change along the path has been developed. The range of
the particles in graphite can be found by this method, and
therefore the initial energy of the particles can be deter-
mined. (auth)

2318   NAA-SR-20
North American Aviation, Inc., Downey, Calif.
THEORY OF IONIZATION AND ATOMIC DISPLACEMENTS
PRODUCED BY FAST PARTICLES IN GRAPHITE. II.
ANALYSIS OF RESISTIVITY-RANGE MEASUREMENTS.
F. W. Brown and F. E. Faris. Feb. 15, 1951. Decl. Dec.

6, 1955. 37p. Contract AT-11-1-GEN-8. $6.30(ph OTS);
$3.00(mf OTS).

Experimental data on resistivity change vs. depth of
particle penetration in graphite irradiated with protons,
deuterons, and α particles is analyzed in detail from the
standpoint of collision theory. Satisfactory agreement be-
tween theory and experimental data has been obtained under
the assumption that the slope of the resistivity saturation
curve for zero incident charge density is proportional to
the theoretically computed values of the rate of energy loss
by elastic collisions for those collisions transferring more
than 25 ev to the carbon atoms. The effect of porosity of the
graphite on particle straggling is found to be an important
consideration. The theory of this straggling has been
worked out, and the agreement with experiment is satis-
factory. Tables giving data for the residual range in
graphite as a function of energy and the space rate of
energy loss to ionization and to displacement production as
a function of residual range in graphite are presented. (auth)

2319   NAA-SR-67
North American Aviation, Inc., Los Angeles.
TENSILE STRENGTH OF TYPE EBP GRAPHITE AT
ELEVATED TEMPERATURES AND ITS RELATION TO
APPARENT DENSITY AT ROOM TEMPERATURE. A. F.
Gorton and C. Malmstrom. Mar. 13, 1950. Decl. Dec.
5, 1955. 8p. $1.80(ph OTS); $1.80(mf OTS).

The tensile strength of Type EBP graphite (National
Carbon Co.) was measured at temperatures ranging from
20 to 3200°C. The strength varied from about 3500 lb/in^2
at room temperature to a maximum of about 7500 lb/in^2 at
2600°C, above which temperature it fell off rapidly to
zero at about 3200°C. A linear correlation between hot
strength and apparent density at room temperature was
found and the strength was normalized to a density of
1.67 g/cc. (auth)

2320   NAA-SR-68
North American Aviation, Inc., Los Angeles.
A NEW CIRCUIT FOR PRECISION MEASUREMENT OF THE
HALL AND MAGNETO-RESISTIVE EFFECTS WITH RE-
SULTS OF OBSERVATIONS ON REACTOR IRRADIATED
GRAPHITE. W. P. Eatherly and J. J. Donoghue. Apr. 5,
1950. Decl. Dec. 6, 1955. 33p. $6.30(ph OTS); $3.00(mf
OTS).

A new circuit is described employing alternating current
for the measurement of galvanomagnetic effects. A null
method is used to compare the signal voltage with that from
a voltage divider powered by the sample current. Effects of
current fluctuations are thus eliminated and balances are
readily made to 0.01 μv. The over-all precision is better
than 0.03 μv for voltages of less than one mv. The Hall
coefficient in homogeneous graphite has been determined
with a precision of 0.003 emu. The magneto-resistive co-
efficient has been measured simultaneously to a precision
of 0.003×10^{-10} emu. This precision is limited only by the
small size of the samples and the consequent small current.
Changes in the coefficients were studied over extremes of
reactor irradiation. Noteworthy were the almost immediate
changes in the graphite from a predominantly electronic to
a predominantly hole conductor, and negative values of the
magneto-resistivity coefficient for intermediate exposures.
(auth)

Refer also to abstract 2555.

LABORATORIES AND EQUIPMENT

2321   CF-52-3-155
[Oak Ridge National Lab., Tenn.]
DESIGN OF ORIFICES FOR SAMPLING PROCESS GAS
FROM THE DISSOLVER OFF-GAS SYSTEM IN THE IDAHO
CHEMICAL PROCESSING PLANT (BLDG. CPP 604).
William L. Carter. Mar. 20, 1952. Decl. Dec. 15, 1955.
14p. Contract [W-7405-eng-26]. $3.30(ph OTS);
$2.40(mf OTS).

Design specifications are presented for orifices for the
removal of gas samples for laboratory analysis from the
process gas stream in the dissolver off-gas system in
the Idaho Chemical Processing Plant. The entire system
operates at sub-atmospheric pressure and the sampling
system operates at the existing pressure. Calculations
are included which illustrate the manner in which the
sizes of the various orifices were determined. (C.H.)

2322   KLX-1392
Vitro Corp. of America, New York.
MANUFACTURING SPECIFICATIONS—MAGNETIC
INDUCTION FLOWMETER. Job 24-B4. Alvin Soffler.
Aug. 15, 1953. Decl. Dec. 5, 1955. 29p. Contract AT(30-
1)-850. $4.80(ph OTS); $2.70(mf OTS).

An instrument for the remote measurement of liquid
volume flow is described. It consists of two major
components: the detector, consisting of a flow tube,
electromagnet and housing, and a recorder which is a
modified circular-chart recorder. This instrument is
especially applicable for use with radioactive, corrosive,
or otherwise hazardous liquids and where a high degree of
accuracy is desired. (E.S.)

2323   ORNL-19
Oak Ridge National Lab., Tenn.
DESIGN DETAILS OF REMOTE HANDLING EQUIPMENT.
M. C. Leverett. Mar. 16, 1948. Decl. Nov. 28, 1955.
14p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40
(mf OTS).

A list of drawings is presented of remote-control
chemical laboratory-scale handling equipment used at
Hanford. (C.H.)

RARE EARTHS AND RARE-EARTH COMPOUNDS

Refer to abstract 2391.

SEPARATION PROCEDURES

2324   A-2710
Purdue Univ., Lafayette, Ind.
THE SEPARATION OF URANIUM FROM OTHER ELE-
MENTS BY THE ETHYL ETHER EXTRACTION OF A
NITRATE SOLUTION. A. M. Ribley, C. V. St. John, H.
Hunt, T. DeVries, and M. G. Mellon. Mar. 8, 1946. Decl.
Dec. 8, 1955. 9p. Contract W-7405-eng-74. $1.80(ph
OTS); $1.80(mf OTS).

A method is described for extracting U from a nitrate
solution with ethyl ether. The sample is evaporated to the
point of incipient crystal formation, then the concentrate is
transferred to the extractor using a solution $\frac{3}{4}$ saturated
with $Ca(NO_3)_2$ and 5 to 10% HNO_3 by volume. Small amounts
of other ions are also extracted. The amount of Fe ex-
tracted is diminished by removal of chloride ion from the

solution before extraction. The amounts of Cr and V
extracted are decreased by treatment of the sample with
Na bisulfite prior to extraction. At least 99.8% of the U is
extracted under the conditions described. (auth)

2325   A-3511
Du Pont de Nemours (E.I.) & Co. Jackson Lab.,
Wilmington, Del.
A SURVEY OF THE DEVELOPMENT OF CELLS FOR THE
PRODUCTION OF FLUORINE. Final Summary Report.
R. C. Downing. Jan. 15, 1946. Decl. Dec. 8, 1955. 44p.
Contract W-7412-eng-151. (JWD-74) $7.80(ph OTS);
$3.30(mf OTS).

A survey and re-examination of experimental work on
the development of fluorine cells are reported. The most
satisfactory fluorine cell in use at the present time is the
medium temperature, carbon anode unit. This cell
operates at high current efficiency with very little corro-
sion. Monel metal is the most durable material of con-
struction for the can and skirt but steel is satisfactory
when operating conditions are carefully controlled. The
can is maintained at cathode potential in order to reduce
corrosion to a minimum. A neoprene rubber gasket is
used as insulation. Diaphragms made from Monel have
given superior performance to both experimental and
plant use. (auth)

2326   AECD-3809
Oak Ridge National Lab., Tenn.
DEVELOPMENT OF THE HIGGINS CONTINUOUS ION
EXCHANGE CONTACTOR FOR RECOVERY OF URANIUM
FROM LEACHED ORE PULPS. I. R. Higgins, C. W.
Hancher, and T. A. Arehart. Mar. 25, 1955. Decl. with
Deletions Dec. 3, 1955. 22p. Contract W-7405-Eng-26.
$4.80(ph OTS); $2.70(mf OTS).

The Higgins continuous countercurrent ion exchange
contactor was developed for use in the recovery of U from
low-grade ores. Results are summarized from tests of
the 2- and 4-inch model Higgins contactor under various
operating conditions using pulp mill feed. Resin attrition
studies are also reported. (C.H.)

2327   BNL-2388
Brookhaven National Lab., Upton, N. Y.
THE EVALUATION OF MONTMORILLONITE CLAY FOR
THE PICKUP AND FIXATION OF M.F.P. ACTIVITY IN
THE PRESENCE OF BORIC ACID. George P. Simon.
Sept. 27, 1954. Decl. Dec. 5, 1955. 13p. $3.30(ph OTS);
$2.40(mf OTS).

An attempt was made to evaluate the pickup of mixed
fission product activity on montmorillonite clay from
boric acid solutions (0.1M). The average decontamination
factor observed for an eight liter run using a 30 g ex-
truded clay column was 190. This decontamination factor
shows no apparent sign of decreasing at the present time.
The clay column effluent was further cleaned by using
various organic cation and anion exchangers. It has been
observed that an overall process decontamination factor
of 0.5×10^4 may be realized with a clay-anion exchanger
system. (auth)

2328   BNL-2399
Brookhaven National Lab., Upton, N. Y.
CORE PROCESS FOR THE REMOVAL OF Zr^{93}. M. B.
Brodsky. Feb. 24, 1955. Decl. Dec. 2, 1955. 3p. $1.80
(ph OTS); $1.80(mf OTS).

A process is described for the removal of Zr^{93} from
the U—Bi core solution of the Liquid Metal Fuel Reactor.

Nautral Zr is added to the process stream to reach the solubility limit of Zr at 550°C. The solution is then cooled to 350°C to precipitate 88% of the Zr. This also removes 88% of the Zr^{93}. Alternate methods for further processing of the liquid solution are suggested. The process assumes that Zr and U will be soluble to the same extent in the presence of each other as they are in pure Bi. It is expected that the rate of Zr^{93} production will equal its rate of removal at steady state. (M.P.G.)

2329   CF-52-2-217

Oak Ridge National Lab., Tenn.

ELECTROCHEMICAL STUDIES; QUARTERLY REPORT FOR PERIOD NOVEMBER 10, 1951—FEBRUARY 10, 1952. J. A. McLaren, J. H. Goode, and H. L. Peeler. Feb. 29, 1952. Decl. Dec. 16, 1955. 15p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40(mf OTS).

Progress is reported on the following studies: electrolytic decontamination of process equipment; electrolytic acid adjustment of $UO_2(NO_3)_2$ solutions and $Pu(NO_3)_4$ solutions from the Purex Process; and electrolytic production of H and O. (C.H.)

2330   HW-15742

Hanford Works, Richland, Wash.

THE SEPARATION OF TRACE AMOUNTS OF RADIOACTIVE Cs FROM MACRO QUANTITIES OF SODIUM AND POTASSIUM SALTS. R. C. Thorburn. Jan. 27, 1950. Decl. Dec. 6, 1955. 10p. [Contract W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

A method for the separation of trace amounts of Cs from macro quantities of Na and K using an ion exchange resin, Dowex 50, has been developed. A 95% recovery of Cs with a reduction of the solid content of 95% was found possible. Curves illustrating the effect of acidity, column length, and flow rate are presented. The Na, H, and ammonium forms of Dowex 50 were investigated; the H form was found to give the best separation. (auth)

2331   MonT-408

Clinton Labs., Oak Ridge, Tenn.

THE EXTRACTION OF URANYL NITRATE BY METHYL ISOBUTYL KETONE. A THERMODYNAMIC STUDY. H. M. Feder. Oct. 13, 1947. Decl. Dec. 6, 1955. 52p. Contract W-35-058-Eng-71. $9.30(ph OTS); $3.60(mf OTS).

The partition coefficient for un-ionized HNO_3 between hexone and H_2O is 3.85 ± 0.20. The dissociation constant of nitric acid in water-saturated hexone is $(2.5 ± 0.5) \times 10^{-4}$. The hydrolysis and ionization of $UO_2(NO_3)_2$ in H_2O and the form of $UO_2(NO_3)_2$ in hexone are discussed, and its activity coefficients obtained. The equilibrium constant for the formation of un-ionized $UO_2(NO_3)_2$ in hexone from ionic $UO_2(NO_3)_2$ in H_2O is 0.19 ± 0.01. The distribution of $UO_2(NO_3)_2$ between hexone and H_2O containing HNO_3 and $Al(NO_3)_3$ is predicted and shown to be in reasonable agreement with experimental data. (auth)

2332   UCRL-126

California. Univ., Berkeley. Radiation Lab.

THE CHELATE PROCESS III. PRELIMINARY CONTINUOUS-OPERATION STUDIES. B. Rubin and T. E. Hicks. [nd]. Decl. Dec. 6, 1955. 26p. Contract [W-7405-eng-48]. $4.80(ph OTS); $2.70(mf OTS).

The rate of extraction of Pu^{IV} in either direction between benzene-TTA and aqueous HNO_3 solutions is shown in the present study to be fast enough so that application of the chelate process to continuous operation should be feasible. This conclusion is based on the two primary

considerations that the mechanism limiting the rate of extraction appears to be diffusion-and not chemical-reaction-limiting, and that the extraction may be controlled by adjustment of the system conditions to give almost any desired specifications of rate and/or equilibrium. A continuous process involving multiple extraction stages with a controlled pH gradient is proposed for obtaining maximum decontamination and plutonium recovery. (auth)

2333   UCRL-764

California. Univ., Berkeley. Radiation Lab.

THE DISTRIBUTION OF TRACE URANIUM(VI) IN NITRIC ACID—TTA—ORGANIC SOLVENT MIXTURES. D. L. Heisig and H. W. Crandall. June 30, 1950. Decl. Dec. 8, 1955. 31p. Contract W-7405-eng-48. $4.80(ph OTS); $2.70(mf OTS).

The distribution of U^{6+} in systems of HNO_3, TTA, and hexone, cyclohexanone, or pentaether has been shown to depend upon three specific reactions. The values of the equilibrium constants in pentaether and cyclohexanone when activity effects are neglected have been estimated at various nitric acid concentrations. These constants can be used to calculate the distribution coefficient of U^{6+} with an accuracy of 15% in pentaether—HNO_3 mixtures containing up to 1.42$\underline{M}$ total HNO_3 and 0.6$\underline{M}$ TTA and in cyclohexanone—HNO_3 mixtures containing up to 1.0$\underline{M}$ total HNO_3 and 0.5$\underline{M}$ TTA. (auth)

2334   UCRL-1294

California. Univ., Berkeley. Radiation Lab.

ION EXCHANGE EXPERIMENTS WITH POLONIUM. Edward R. Tompkins. May 11, 1951. Decl. Dec. 7, 1955. 15p. Contract W-7405-eng-48. $3.30(ph OTS); $2.40(mf OTS).

The state of Po in aqueous solutions was investigated by means of ion exchange equilibrium studies. The distribution of the Po between the solid and liquid phases was determined for solutions of various compositions using both a cation and an anion exchanger. These studies show that in the absence of a complexing agent Po is hydrolyzed to such a degree that it forms monovalent cations and anions whose charge was not investigated in this study. On the basis of these results and previous work it appears that these ions may be $PoO(OH)^+$ and PoO_3^{-2}. The addition of a complexing anion such as chloride decreases both the cationic and anionic form of Po up to a chloride concentration of about 0.01$\underline{M}$. At higher chloride concentrations the cation concentration continues to decrease while the percentage of Po in the anionic state increases. In the absence of a complexing anion, no effect of H ion on the state of hydrolysis of the Po could be noted. In the presence of chloride the H ion concentration is very important in determining the fractions of Po in the cationic, neutral and anionic states. (auth)

2335   Y-253

Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.

RHENIUM RECYCLE OPERATIONS. B. S. Weaver and J. L. Williams. Sept. 1, 1948. Decl. Dec. 6, 1955. 25p. Contract W-7405-eng-26. $4.80(ph OTS); $2.70(mf OTS).

The scarcity of rhenium required recovery from the calutrons after separation of its isotopes. A recovery process was developed and applied to the material on hand. A supply of purified metal was made available for further use. New fundamental knowledge of rhenium chemistry was gained. (auth)

2336 Y-328

Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.

THE SEPARATION OF THE STABLE ISOTOPES OF NICKEL. J. R. Patton and C. P. Keim. Aug. 9, 1948. Decl. Dec. 6, 1955. 33p. Contract W-7405-eng-26. $6.30 (ph OTS); $3.00(mf OTS).

A comprehensive report is given covering the concentration of nickel isotopes 58, 60, 61, 62 and 64. Calutron operations, chemical refinement, isotopic assays, enhancement, and inventory quantities are included. (auth)

2337 Y-463

Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.

RECOVERY FROM CARNOTITE ACID LEACH LIQUORS. C. F. Coleman and G H. Clewett. Aug. 8, 1949. Decl. Dec. 6, 1955. 26p. Contract W-7405-Eng-26. $4.80 (ph OTS); $2.70(mf OTS).

A tentative process for removal of uranium and vanadium as uranous and vanadic phosphates from acid carnotite leach liquors is presented and compared with existing processes. The uranium is recovered as the dioxide; material balances and product analyses are given. A uranous arylsulfinate can be precipitated instead of the phosphate. Advantages and disadvantages of the process are discussed, together with variations which are being investigated to meet the latter. (auth)

Refer also to abstract 2461.

SORPTION PHENOMENA

2338 CF-51-6-91

[Oak Ridge National Lab., Tenn.]

ANALYSIS OF Xe-CARBON ADSORPTION DATA REPORTED IN MON T-221, DECEMBER 13, 1946. S. H. Jury. June 21, 1951. Decl. Dec. 16, 1955. 11p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Equations applicable to calculations of the dynamic adsorption of dilute rare gases on beds of activated adsorbents are presented. The equations are applied to calculations of Xe adsorption on activated C. Experimental results are compared with theoretical values. (C.H.)

SPECTROSCOPY

2339 HW-17521

[Hanford Works, Richland, Wash.]

STATISTICAL EVALUATION OF CALIBRATION DATA-INFRARED METHOD FOR DETERMINATION OF % TBP. W. C. Healy, Jr. Mar. 21, 1950. Decl. Dec. 5, 1955. 2p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

A statistical analysis was made on calibration data on optical densities from infrared spectrometer readings on eight standard samples of tributyl phosphate ranging in % TBP from 6.71 to 17.85. Readings were taken at both 1031 cm^{-1} and 1061 cm^{-1} wave lengths. Using least squares methods, quadratic equations in % TBP were fitted to the data at each wave length. Results indicate approximately equal precision in estimating % TBP from either equation. (C.H.)

2340 K-104

Carbide and Carbon Chemicals Corp. [K-25 Plant], Oak Ridge, Tenn.

METHODS OF MEASURING HELIUM ISOTOPES BY MASS SPECTROMETER. R. F. Smith. Dec. 8, 1947. Decl. Dec. 5, 1955. 19p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

A modified isotope mass spectrometer was used successfully to measure the He 3 concentration of normal, depleted, and enriched He by both absolute and relative methods. The absolute method was used to measure the ratio of He 4 to He 3 in normal gas well He. The relative method was used to measure the ratio of He 3 in enriched and depleted samples to He 3 in normal. Samples analyzed by both methods gave comparable results. (auth)

SYNTHESES

2341 A-1507

Purdue Univ., Lafayette, Ind.

PREPARATION OF CERTAIN POLYHALOGENATED COMPOUNDS. Monthly Technical Report [covering period] April 1, 1944 to May 1, 1944. E. T. McBee. May 10, 1944. Decl. Dec. 8, 1955. 40p. Contract W-7405-eng-74. $6.30(ph OTS); $3.00(mf OTS).

Methods are described for the chlorination and fluorination of polychloroheptanes, and the preparation of polychloropolyfluoroheptanes, perhaloheptanes, dichloroperfluoroheptanes, bis(trifluoromethyl)benzene, 1-methyl-4-chloromethylbenzene, and carbonyl fluoride. (C.H.)

2342 A-2108

Columbia Univ., New York. Div. of War Research.

THERMODYNAMICS OF THE REDUCTION OF CERTAIN HALIDES. Clyde A. Hutchison and James S. Smith. Aug. 10, 1944. Decl. Dec. 7, 1955. 10p. Contract W-7405-eng-50. (100B-R-199; A-1268 (Suppl.)). $1.80(ph OTS); $1.80(mf OTS).

Data are presented on the heats at 298.1°K of the reactions of Cl_2 and F_2 with B. (C.H.)

2343 A-3962

[California. Univ., Berkeley. Radiation Lab.]

PREPARATION OF THENOYLTRIFLUOROACETONE. James C. Reid and Dorothy M. Johnson. Oct. 2, 1946. Decl. Dec. 8, 1955. 5p. $1.80(ph OTS); $1.80(mf OTS).

A synthesis of thenoyltrifluoroacetone, using ethyl trifluoroacetate as the starting material, is presented. (C.W.H.)

2344 UCRL-633

California. Univ., Berkeley. Radiation Lab.

THE HIGHER FLUORIDES OF PLUTONIUM. Leo Brewer, LeRoy A. Bromley, Paul W. Gilles, and Norman L. Lofgren. Mar. 20, 1950. Decl. Dec. 8, 1955. Contract W-7405-eng-48. $3.30(ph OTS); $2.40(mf OTS).

The data published in the National Nuclear Energy Series, Plutonium Project Record, Division IV, Vol. 14B have been used to complete the tabulation of the thermodynamic properties of the compounds of plutonium. From these data, it can be shown that PuF_5 is a stable compound in both condensed and gaseous phases. Methods of preparation are indicated. The data indicate that PuF_6 should be of some importance in the gaseous phase, but it should be an extremely powerful oxidizing agent and thus should be difficult to prepare. Methods of preparation are suggested. (auth)

Refer also to abstract 2310.

TRANSURANIC ELEMENTS AND COMPOUNDS

2345   BC-71

California. Univ., Berkeley. Radiation Lab.
THE REDUCTION OF Pu(VI) BY NITROUS ACID. Robert
E. Connick. Sept. 1, 1946. Revised Aug. 4, 1947. Decl.
Dec. 6, 1955. 20p. $3.30(ph OTS); $2.40(mf OTS).

The reduction of Pu(VI) by nitrous acid in nitric acid
solutions is discussed. The available information in the
project literature relating to this reaction are examined
and interpreted. In nitric acid solutions Pu(VI) is rapidly
reduced to Pu(V) until an equilibrium between Pu(V),
Pu(VI), HNO_2 and NO_3^- is established. The observed effect
of acidity on this equilibrium is in agreement with that
predicted from the equilibrium expression. Using the
concentrations of Pu(V), Pu(VI), HNO_2 and NO_3^- at
equilibrium it was possible to calculate the potential of
the Pu(V) – Pu(VI) couple. The mechanism of the reduction
below the +5 oxidation state is discussed. In sulfuric acid
solution containing uranyl nitrate the equilibrium between
Pu(V), Pu(VI), HNO_2 and NO_3^- appears to be rapidly
established. Reduction below the +5 oxidation state is
faster than in nitric acid solutions. (auth)

2346   CN-2088

[Chicago. Univ.] Metallurgical Lab.
CHEMICAL RESEARCH — BASIC CHEMISTRY OF PLU-
TONIUM REPORT FOR MONTH ENDING SEPTEMBER 1,
1944. Sept. 21, 1944. Decl. Dec. 13, 1955. 31p. $6.30
(ph OTS); $3.00(mf OTS).

The formation and behavior of Pu^{4+} complexes are
studied as a function of pH. The absorption spectrum of
$Pu(NO_3)_6^{2-}$ was studied in nitrate solutions. The hydrolytic
behavior of Pu^{6+} is compared with that of U^{6+}. A number
of experiments were performed on the rates of Pu redox
reactions. (K.S.)

2347   HW-17266

Hanford Works, Richland, Wash.
THE OXIDATION OF PLUTONIUM TO THE PLUTONYL
STATE. H. W. Miller and R. J. Brouns. Mar. 22, 1950.
Decl. Dec. 5, 1955. 10p. Contract W-31-109-Eng-52.
$1.80(ph OTS); $1.80(mf OTS).

Several methods of oxidizing Pu to the plutonyl ion in an
acid solution were investigated and an ozonization
procedure was selected as the most satisfactory. Oxygen
gas containing ozone is bubbled through a 2N HCl
solution of the Pu for 2 to 8 hr. the time depending upon
the amount of Pu in the sample. The ozone was prepared
by passing acid scrubbed, alkali scrubbed, and dried
oxygen through a modified Siemen's ozonator. Moisture
must be scrupulously excluded from the ozonator. The
advantages of the ozonization procedure for plutonium
oxidation are: the oxidation is quantitative; no foreign
substances are added; the apparatus and procedure are
simple and convenient; and the overall time consumed is
relatively small. The plutonyl solutions in 2N HCl were
stable; no appreciable reduction, in the absence of
impurities, was observed in 20 days. (auth)

2348   LA-347

Los Alamos Scientific Lab., N. Mex.
CALORIMETRIC DETERMINATION OF THE ENERGY
PRODUCED BY 49 [Pu^{239}]. W. M. Jones and J. W. Stout.
Aug. 17, 1945. Decl. Dec. 10, 1955. 15p. $3.30(ph OTS);
$2.40(mf OTS).

The rate of energy production by a 120-gram Pu^{239}

sphere has been measured calorimetrically. The method
was to measure the rate of evaporation of liquid nitrogen
by the heat of the sphere and compare this rate with that
produced by the introduction of electrical energy. The
power produced by Pu^{239} is $1.923 \times 10^{-3} \pm 1\%$ abs watts/
gram. Combining this with the energy per α particle
determined from range and range-energy measurements,
one obtains 2.411×10^4 years as the half life of Pu^{239} with
respect to alpha emission. (auth)

2349   LA-502

[Los Alamos Scientific Lab., N. Mex.]
DILATOMETRIC STUDIES ON THE ALLOTROPIC TRANS-
FORMATION OF PLUTONIUM. A. E. Martin, G. D.
Selmanoff, D. B. Loeb, P. C. Norhaft, S. L. Simons, and
J. R. Wilson. Sept. 1, 1945. Decl. Dec. 8, 1955. 15p.
Contract [W-7405-eng-36]. $3.30(ph OTS); $2.40(mf OTS).

The anomalous length changes which accompany the
transformations have been of great assistance in dem-
onstrating that Pu has five allotropic modifications, and
in determining the temperature ranges over which these
phases exist. The volume change accompanying the α-β
transformation is unusually large (about 12%), and the δ
phase is characterized by a negative coefficient of thermal
expansion. (auth)

2350   LA-639

[Los Alamos Scientific Lab., N. Mex.]
THERMAL ANALYSIS OF PLUTONIUM. L. G. Doom and
Robert Kamm. May 28, 1944. Decl. Dec. 8, 1955. 12p.
Contract [W-7405-eng-36]. $3.30(ph OTS); $2.40(mf OTS).

The apparatus used for determination of thermal arrests
in Pu was essentially a vacuum furnace with means of
obtaining a fairly constant rate of temperature increase of
the sample while measuring the sample temperature
accurately. A melting point of $627 \pm 3°C$ was established.
(L.M.T.)

2351   LA-1314

Los Alamos Scientific Lab., N. Mex.
DETERMINATION OF CADMIUM IN PLUTONIUM-
CADMIUM SOLUTIONS. Karl S. Bergstresser and
Elgin H. Rex. Sept. 15, 1951. Decl. Dec. 12, 1955.
15p. $3.30(ph OTS); $2.40(mf OTS).

Determination of Cd in Pu—Cd alloys was successfully
accomplished by separating the Pu as an insoluble per-
oxide, evaporating the alloy containing the Cd, and weighing
the latter as a sulfate. (auth)

2352   LA-1315

Los Alamos Scientific Lab., N. Mex.
DETERMINATION OF BISMUTH IN PLUTONIUM-
BISMUTH SOLUTIONS. Karl S. Bergstresser. Sept.
15, 1951. Decl. Dec. 12, 1955. 24p. $4.80(ph OTS);
$2.70(mf OTS).

A gravimetric method for determining Bi in Pu—
Bi alloys includes removal of the Pu by peroxide pre-
cipitation, separation of the Bi by precipitation with
sodium carbonate, and final ignition of the Bi as a phos-
phate. (auth)

2353   UCRL-78

California. Univ., Berkeley. Radiation Lab.
SPECTRAL LINES OF CURIUM FROM 3100 A TO 4200 A.
John G. Conway and Milton F. Moore. Apr. 7, 1948.
Decl. Nov. 28, 1955. 5p. Contract W-7405-eng-48.
$1.80(ph OTS); $1.80(mf OTS)

Fifty-four spectral lines of Cu are listed together with
estimated intensities. A brief description of the manner of

taking the spectra and of measuring the lines is given. (auth)

2354   UCRL-226
California. Univ., Berkeley. Radiation Lab.
THE ACTIVITY COEFFICIENT OF PLUTONIUM(IV) SALTS IN ACIDIC SOLUTIONS. R. E. Connick and W. H. Reas. Nov. 1948. Decl. Dec. 7, 1955. Contract W-7405-eng-48B. $9.30(ph OTS); $3.60(mf OTS).

The activity coefficient of $Pu(ClO_4)_4$ was measured in perchloric acid solutions. The procedure used was to measure the extraction of the neutral plutonium(IV)-TTA chelate into benzene-TTA solutions at different perchloric acid concentrations. Equations are presented which show the relation of the extraction coefficients, obtained in the above manner, to the activity coefficient of plutonium(IV) perchlorate. (auth)

Refer also to abstracts 2301, 2379, 2391, 2505, and 2506.

URANIUM AND URANIUM COMPOUNDS

2355   A-36
[National Bureau of Standards, Washington, D. C.].
THE PREPARATION OF URANIUM. Clement J. Rodden. [194?]. Decl. Nov. 30, 1955. 7p. $1.80(ph OTS); $1.80(mf OTS).

A laboratory method is described for the preparation of U metal in a fused state by the reduction of U chloride with Ca in a refractory-lined bomb. (C.H.)

2356   A-99
Columbia Univ., New York.
A NEW CRYSTALLINE HYDRATE OF URANIUM TETRAFLUORIDE, $2UF_4 \cdot 5H_2O$, AND ITS DEHYDRATION TO ANHYDROUS URANIUM TETRAFLUORIDE. A. V. Grosse. March 1941. Decl. Dec. 6, 1955. 9p. $1.80 (ph OTS); $1.80(mf OTS).

A new crystalline hydrate of UF_4 of the formula $2UF_4 \cdot 5H_2O$, was obtained by treating the usual amorphous uranous fluoride precipitate with dilute HF. This compound dehydrates without side reactions to pure UF_4. The latter is very porous and suitable for the exchange and other reactions. (auth)

2357   A-456
National Bureau of Standards, [Washington, D. C.]
DENSITY OF SOLID HEX [UF_6] NEAR THE TRIPLE POINT, AND THE EXPANSIVITY OF THE LIQUID FROM THE TRIPLE POINT TO 92°C. Martin T. Wechsler and Harold J. Hoge. Feb. 25, 1943. Decl. Dec. 8, 1955. 4p. $1.80(ph OTS); $1.80(mf OTS).

2358   A-538
Columbia Univ., New York. Div. of War Research.
THE DESIGN OF VALVES FOR USE WITH HEX [UF_6]. Homer F. Priest. Jan. 15, 1943. Decl. Dec. 8, 1955. 23p. Contract OEMsr-412. (1DR-28). $4.80(ph OTS); $2.70(mf OTS).

Valves used to handle uranium hexafluorides, and modifications made on existing valves to make them usable, are described. (C.H.)

2359   A-708
Columbia Univ., New York. Div. of War Research
MONTHLY REPORT FOR UTILIZATION. M. Kilpatrick. May 15, 1943. Decl. Dec. 8, 1955. 20p. Contract OEMsr-412. (2R-328) $3.30(ph OTS); $2.40(mf OTS).

The work of this section was concerned with the

preparation and evaluation of U slurries for the deuterium oxide moderated pile. Data are presented on the decomposition of hydrogen peroxide, the composition and stability of the peroxide of U in air and water, thermodynamics of U oxide systems, and the scratch hardness of U oxides. (C.H.)

2360   A-726
Brown Univ., Providence.
SUMMARIZING REPORT OF INVESTIGATIONS RELATING TO URANIUM COVERING THE PERIOD SEPTEMBER 1, 1942 TO APRIL 15, 1943. Charles A. Kraus. June 1, 1943. Decl. Dec. 8, 1955. 7p. Contracts OEMsr-290, Suppl. 3 and OEMsr-688, Suppl. 1. (BT-22; 100XR-1200). $1.80 (ph OTS); $1.80(mf OTS).

An investigation is presented on the production of U chlorides and their reduction by means of Na for the production of metallic U_f. (J.E.D.)

2361   A-731
Du Pont de Nemours (E. I.) & Co. Jackson Lab., Wilmington, Del.
DISTILLATION OF TUBEALLOY HEXAFLUORIDE (PRODUCT 616). J. C. Smith. May 7, 1943. Decl. Dec. 8, 1955. 7p. (100XR-1219) $1.80(ph OTS); $1.80(mf OTS).

The refining of 558 pounds of uranium hexafluoride by distillation is described. (C.H.)

2362   A-732
Columbia Univ., New York. Div. of War Research.
VISCOSITY OF LIQUID UF_6 AT 70°C. A. D. Kirshenbaum. June 10, 1943. Decl. Dec. 8, 1955. 5p. Contract W-7405-eng-50. (1-R128). $1.80(ph OTS); $1.80(mf OTS).

A modified Ostwald viscosimeter was employed in measurements of the viscosity of liquid UF_6 at 70°C. The absolute viscosity of UF_6 was determined to be a little less than twice that of water, and the kinematic viscosity of water was determined to be a little greater than twice that of UF_6. (C.H.)

2363   A-777
Columbia Univ., New York.
URANIUM OXIDE—WATER SLURRIES FOR THE UTILIZATION OF D_2O. M. L. Eidinoff and G. F. Hiskey. Aug. 14, 1943. Decl. Dec. 8, 1955. 26p. Contract W-7405-eng-50. $4.80(ph OTS); $2.70(mf OTS).

Physical and plastic properties of uranium oxide slurries in water were investigated. Slurry systems containing as high as 3.5 g U/ml were prepared. Coefficients of rigidity and the yield values for UO_2-H_2O slurries were determined as a function of the concentration. (C.W.H.)

2364   A-2314
Brown Univ., Providence. [Metcalf Research Lab.]
FACTORS IN THE PRECIPITATION OF RO_4 [UO_4] WHICH INFLUENCE THE STATE OF THE RESULTING OXIDE PARTICULARLY WITH RESPECT TO ITS REACTIVITY IN THE VAPOR PHASE REACTION. Charles A. Kraus. July 19, 1945. Decl. Dec. 14, 1955. 6p. Contract W-7405-eng-73. (BT-53). $1.80(ph OTS); $1.80(mf OTS).

Factors (stirring, pH, and amount of H_2O_2 used) in the preparation of UO_4 were investigated. With adequate mixing, any acidity with a pH average of 1.5 to 3.0 was suitable, and it was unnecessary to wash the precipitate to obtain a reactive UO_2. A 3- to 5-fold excess of H_2O_2 was used. (C.W.H.)

2365   A-2321
Brown Univ., Providence. [Metcalf Research Lab.]
PREPARATION OF RCl_4 [UCl_4] BY VAPOR PHASE

CHLORINATION OF RO_2, $[UO_2]$ FORMED BY REDUCING
RO_3 $[UO_3]$ WITH ETHANOL. REPORT NO. II. Charles A.
Kraus. Sept. 17, 1945. Decl. Dec. 13, 1955. 11p.
Contract W-7405-eng-73. (BT-60). $1.80(ph OTS);
$1.80(mf OTS).

Investigations were continued on the preparation of
UCl_4 by the vapor phase chlorination of UO_2. Uranium
dioxide, produced at the lower temperatures, chlorinated
better than the oxide prepared at higher reduction temper-
atures. Best results were obtained by chlorinating at
400°C. (C.W.H.)

2366   A-2703
Purdue Research Foundation, Lafayette, Ind. and Purdue
    Univ., Lafayette, Ind.
THE RECOVERY OF TUBALLOY [U] FROM CARBON-
PARTS. Summary Report. E. T. McBee, Thomas DeVries,
and L. R. Evans. Nov. 5, 1945. Decl. Dec. 8, 1955. 18p.
Contract W-7405-eng-74. $3.30(ph OTS); $2.40(mf OTS).

The recovery of tuballoy from carbon-parts has been
investigated by burning the C in the presence of a basic
substance such as sodium carbonate which, at the same
time, converts the tuballoy into a soluble form and ex-
tracting the tuballoy with hot nitric acid. Sodium peroxide,
sodium hydroxide, calcium carbonate, and sodium carbon-
ate were investigated as aids in burning carbon parts.
Sodium carbonate was found to be the most effective.
Mixtures of sodium carbonate and carbon-parts tend to
sinter at high temperatures. Eschka's mixture, calcium
oxide-sodium carbonate mixtures, and calcium carbonate
were found to be less effective than sodium carbonate but
the mixtures did not sinter. No appreciable loss of tuballoy
was observed during the burning of carbon parts with
sodium carbonate. More than 90% of the tuballoy present
in the carbon-parts was converted to a soluble form by
heating a mixture of sodium carbonate and carbon-parts
for 1 hour at about 750°C. The addition of sodium silicate
to a mixture of sodium carbonate and carbon-parts had no
observed effect on the oxidation of the carbon. The most
effective weight ratio of sodium carbonate to ground
carbon-parts for use in the recovery of tuballoy from the
carbon-parts by burning the carbon was found to be 5:1.
At least 90% of the tuballoy present in the carbon-parts can
be removed by digestion with nitric acid for one hour. Con-
centrated nitric acid was found to be only slightly more
effective than 10% nitric acid in extracting tuballoy from
carbon-parts. (auth)

2367   A-2705
Purdue Research Foundation, Lafayette, Ind. and Purdue
    Univ., Lafayette, Ind.
SUMMARY REPORT ON DETERMINATION OF NON-
VOLATILE MATTER IN TUBALLOY TETRACHLORIDE.
E. T. McBee, T. DeVries, and G. M. Rothrock. Dec. 14,
1945. Decl. Dec. 8, 1955. 9p. Contract W-7405-eng-74.
$1.80(ph OTS); $1.80(mf OTS).

A method has been developed to determine if a UCl_4
sample will meet the required volatility specifications,
i.e., whether or not the sample contains less than 1% non-
volatile matter. (C.W.H.)

2368   A-2714
Purdue Research Foundation, Lafayette, Ind. and Purdue
    Univ., Lafayette, Ind.
THE EVALUATION OF URANIUM TETRACHLORIDE.
Analytical Report. R. E. Burns and T. DeVries. Mar.
12, 1946. Decl. Dec. 8, 1955. 11p. Contract W-7405-eng-
74. $3.30(ph OTS); $2.40(mf OTS).

An apparatus has been devised which permits the de-
termination of the volatility characteristics of a sample of
UCl_4 as related to temperature. The device provides a
vertical sample chamber the temperature of which can be
controlled, a horizontal tube the temperature of which can
be maintained constant, and a cold chamber for the
collection of the sublimate. Measurement of the rate of
volatilization of the UCl_4 is made by means of a pendulum
suspended in the horizontal tube. The deflection of the
pendulum is taken as a measure of the rate of volatiliza-
tion. (auth)

2369   A-3143
National Bureau of Standards, Washington, D. C.
THE SPECIFIC HEAT, ENTROPY, AND ENTHALPY OF
T Cl_3 $[UCl_3]$ FROM 0° TO 380°K. W. Julian Ferguson and
John L. Prather. Nov. 18, 1944. Decl. Dec. 8, 1955. 5p.
$1.80(ph OTS); $1.80(mf OTS).

The specific heat, entropy, and enthalpy of UCl_3 from 0°
to 380°K were measured. Data are tabulated. (C.H.)

2370   A-3226
Carbide and Carbon Chemicals Corp. Substitute Alloy
    Materials Labs., New York.
DITUBALLOY ENNEAFLUORIDE $[U_2F_9]$. S. Weller, A.
Grenall, R. Kunin, and P. A. Agron. Mar. 19, 1945. Decl.
Dec. 8, 1955. 6p. (D-R-29). $1.80(ph OTS); $1.80(mf
OTS).

The preparation, identification, and properties of U_2F_9
are discussed. A new reaction is suggested for the de-
composition of UF_5. (C.W.H.)

2371   A-3254
Carbide and Carbon Chemicals Corp. Substitute Alloy
    Materials Labs., New York.
THE POTENTIOMETRIC TITRATION OF TUBALLYL ION
WITH ALKALI. R. Kunin. May 8, 1945. Decl. Dec. 8,
1955. 10p. (D-R-60) $1.80(ph OTS); $1.80(mf OTS).

Potentiometric titrations of UO_2^{2+} were carried out in
alkaline and acid solutions. The end point for the alkaline
titration of UO_2 is pH = 9.05. (C.W.H.)

2372   A-4062
Purdue Research Foundation, Lafayette, Ind.
THE RECOVERY OF URANIUM FROM MACHINE WASH
SOLUTIONS. H. Hunt. [nd] Decl. Dec. 2, 1955. 14p.
$3.30(ph OTS); $2.40(mf OTS).

As an alternate method to the Larson peroxide process
for recovery of U from machine wash, it has been shown
that more then 99% of the U can be recovered as the
hydroxide by precipitation with NH_3. This precipitate
can be freed from Fe by dissolution in HNO_3 and re-
precipitation as the peroxide from a small volume. The
U left in the filtrate from NH_3 precipitation can be
decreased to less than 0.05 ppm. by coprecipitation with
Cu as the hydroxide. (auth)

2373   A-4064
Purdue Research Foundation, Lafayette, Ind.
THE PREPARATION OF URANIUM TETRACHLORIDE
FROM URANIUM OXIDES AND URANYL SOLUTIONS BY
CHLORINATION WITH HEXACHLOROPROPENE (Rough
Draft). R. Mezey. Mar. 15, 1946. Decl. Dec. 5, 1955.
29p. Contract W-7405-eng-74. $4.80(ph OTS); $2.70
(mf OTS).

Uranium tetrachloride was prepared by the reaction of
hexachlorophene with UO_3, UO_4, UNH, UO_2Cl_2, U_3O_8, and
$(NH_4)_2U_2O_7$. The by-products of the reaction with UO_3
were investigated. (C.W.H.)

2374   A-4065

Purdue Research Foundation, Lafayette, Ind.
THE RECOVERY OF URANIUM FROM THE ASH OF
CARBON PARTS (Rough Draft). Thos. De Vries. Mar.
15, 1946. Decl. Dec. 2, 1955. 10p. Contract W-7405-
eng-74. $1.80(ph OTS); $1.80(mf OTS).

An alkaline fusion of calutron electrode ash for the
recovery of U is described. The ash is fused with $K_2S_2O_7$,
reacted with HF, and refused with $K_2S_2O_7$. (C.W.H.)

2375   AECD-3801

Knolls Atomic Power Lab., Schenectady, N. Y.
DENITRATION LOSS OF RUTHENIUM FROM URANYL
NITRATE BETA MOUNTS. H. A. Mahlman and C. W.
Decker. Jan. 25, 1952. Decl. with deletions Dec. 5,
1955. 8p. Contract W-31-109-Eng-52. $1.80(ph OTS);
$1.80(mf OTS).

During the preparation of beta-gamma mounts of
uranyl nitrate it is possible to effect a denitration loss of
approximately 80% of the Ru. By adding hydroxylamine
sulfate and sulfuric acid, the Ru is stabilized and the
denitration loss is eliminated. The standard determina-
tion of Ru by calculation, utilizing a differential counting
technique, has been found to be approximately the same
as the standard denitration of radiochemical assays.
(C.H.)

2376   AECD-3805

Hanford Works, Richland, Wash.
THE DENSITIES OF TRIBUTYL PHOSPHATE-CARBON
TETRACHLORIDE SOLUTIONS CONTAINING URANIUM
AND NITRIC ACID. Robert Lee Moore. Dec. 20, 1949.
Decl. with deletions Dec. 2, 1955. 15p. Contract W-31-
109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

Linear equations have been derived which correlate
the densities of $TBP-CCl_4$ solutions containing U and
HNO_3, with the limits of experimental error, as functions
of U concentration and solvent composition. The dif-
ferences between the densities of equilibrated aqueous and
organic phases are tabulated for 20% $TBP-CCl_4$ as a
function of UNH and HNO_3 concentrations. (auth)

2377   CC-1366

[Battelle Memorial Inst., Columbus, Ohio.]
AN ANALYTICAL METHOD FOR DETERMINING HYDRO-
GEN IN TUBALLOY. H. W. R[ussell] and H. R. N[elson.]
Feb. 9, 1944. Decl. Dec.12, 1955. 10p. (A-2010)
$1.80(ph OTS); $1.80(mf OTS).

A gasometric method is described for the determina-
tion of H_2 in extruded U rods. (C.W.H.)

2378   CC-2957

[Ames Lab., Ames, Iowa.]
ANALYSIS OF URANIUM-MANGANESE ALLOYS. A. S.
Ayers. Oct. 5, 1945. Decl. Dec. 15, 1955. 4p. Contract
W-7405-eng-82. $1.80(ph OTS); $1.80(mf OTS).

The conventional procedures of analysis for U and Mn
can be employed in the analysis of alloys of these metals.
The alloys are reacted with perchloric acid and hydrogen
peroxide, fumed to remove any chloride ions, diluted to
volume and aliquots analyzed by redoximetry. (auth)

2379   CN-1060

Ames Lab., Ames, Iowa.
CHEMICAL RESEARCH—CHEMISTRY OF PLUTONIUM
REPORT FOR MONTH ENDING NOVEMBER 8, 1943.
Decl. Dec. 13, 1955. 9p. (A-1448) $1.80(ph OTS);
$1.80(mf OTS).

A 20 wt.% Ag-U alloy containing Pu was found to
separate 90% of the Pu in the Ag-rich cap which was 4% of
the U. Tracer PuF_4 without carrier and with LaF_3 and
UF_4 carriers is volatile in one atmosphere of HF in the
range of 740 to 800°C. The presence of LaF_3 seems to
decrease the volatility of PuF_4, and a large amount of
UF_4 makes it non-volatile at 800°. Tracer $PuBr_4$ is
volatile in one atmosphere of HBr at 800 to 850°C, but
rare-earth and alkaline-earth fission-product bromides
also volatilize. (auth)

2380   CNL-39

Clinton National Lab., Oak Ridge, Tenn.
HEAT TRANSFER FROM HEX [UF_6]. W. B. Harrison.
Apr. 7, 1948. Decl. Dec. 5, 1955. 14p. Contract W-35-
058-eng-71. $6.30(ph OTS); $3.00(mf OTS).

Qualitative estimates are made for emissivity of
uranium hexafluoride for use in calculations of heat trans-
fer by thermal radiation. Nature of gas radiation is pre-
sented and assumptions used in making estimates are
discussed. Some physical property data are included in
the Appendix. (auth)

2381   HW-8309

Hanford Works, Richland, Wash.
FREEZING POINT DATA FOR UNH-H_2O-HNO_3 SYSTEMS.
M. K. Harmon. Dec. 17, 1947. Decl. Dec. 3, 1955. 10p.
Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf
OTS).

Data are presented on the freezing points of UNH-H_2O
solutions and the effect of HNO_3 on this system. In this
series of experiments twenty-five solutions were prepared
and their freezing points were determined. The composi-
tion of these test samples ranged from 10% to 75% UNH,
and from 0 to 3M HNO_3. In all cases, cooling curves were
obtained, and the setting point wherever possible was
determined as the true freezing temperature. Crystal
formation was observed closely with the aid of a strong
light source, and the temperature at which crystals were
first noted was taken noted as the freezing point for those
solutions whose cooling curves exhibited no setting point.
In general, the results show that within the limits of nitric
acid concentration investigated, solutions containing UNH
equal to or greater than 57.5% by weight display a steady
increase in freezing temperatures with increase in the
concentration of HNO_3, and that solutions containing 30%
or less UNH show a uniform lowering of freezing points as
the HNO_3 content is increased. Solutions whose composi-
tions lie between 30% and 57.5% UNH all exhibit minima,
the positions of which depend upon the molarity of nitric
acid present. (auth)

2382   HW-10137

Hanford Works, Richland, Wash.
REDOX PROCESS CHEMISTRY. FREEZING POINT DATA
FOR UNH-NH_4NO_3-HNO_3-H_2O SYSTEMS. M. K. Harmon
and V. R. Cooper. July 7, 1948. Decl. Dec. 2, 1955. 12p.
Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf
OTS).

Data are presented from studies on the freezing point
of UNH-NH_4NO_3-HNO_3-H_2O systems. The compositions
of the test samples ranged from zero to approximately
55% UNH, for each of a series of four HNO_3 concentrations
(0.0, 0.3, 1.0, 3.0M). The NH_4NO_3 concentration in all
solutions was as close to 4.0M as possible. Wherever
possible, cooling curves were obtained, and the setting
point was compared with the melting temperature

obtained upon reheating. Where no supercooling occurred, the freezing point was taken as the point of incipient crystallization, determined with the aid of a strong light source. In general, the behavior of the systems investigated was similar to that of those solutions previously studied, and as expected, the curves exhibited approximately the same minimum freezing temperatures ($-20°C$). Due, however, to the greatly increased amount of solute present, these minima occurred uniformly at much lower UNH concentrations (26 to 30%) than the corresponding solutions containing no NH_4NO_3. With due regard to this shift caused by the presence of NH_4NO_3, the positions of these minima (a characteristic of all solutions below 32% UNH) are governed, as before, by the HNO_3 concentration. Moreover, it can be seen that between 1 and 3M HNO_3, an acid concentration is reached, above which, the minimum temperature is attained when the solution contains no UNH. Any increase of either HNO_3 or UNH in such systems can result only in a decided elevation of the freezing point. (auth)

2383   HW-12450
Hanford Works, Richland, Wash.
A MICRODETERMINATION OF URANIUM BY FERRIC SULFATE TITRATION. E. W. Christopherson. Feb. 16, 1949. Decl. Dec. 2, 1955. 14p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf OTS).

Following nitrate removal by means of a three-stage hydrochloric acid digestion, U was reduced with chromous sulfate reagent. In an inert atmosphere, the quadrivalent uranium was titrated at 80 to 95° with standard ferric sulfate solution. The end point was obtained with a potentiometric cell including a platinum in-titrant reference electrode and a platinum indicator electrode. Application was made to various low level U solutions. For samples containing 1 to 12 milligrams of U, less than one percent error may be expected. Iron and chromium do not interfere. (auth)

2384   KAPL-421
Knolls Atomic Power Lab., Schenectady, N. Y.
ANALYSIS OF SINTERED MIXED OXIDES OF URANIUM AND BERYLLIUM. J. Rynasiewicz, M. Sleeper, and V. Consalvo. Oct. 16, 1950. Decl. Dec. 6, 1955. 9p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

A detailed procedure is presented for the analysis of difficulty soluble sintered beryllium oxide—uranium oxide extrusions containing nearly equal amounts by weight of the two oxides. The UO_2 is partially dissolved in hot HNO_3, the BeO skeleton is dissolved in refluxing H_2SO_4, and the insoluble residue is fused with Na_2O_2 in a nickel crucible lined with Na_2CO_3. Uranium is separated and weighed as the oxinate (8-hydroxyquinolate), and beryllium is determined as the pyrophosphate. The accuracy of the method is discussed, and its advantages are compared with those of other methods. (C.H.)

2385   LA-147
[Los Alamos Scientific Lab., N. Mex.]
PRODUCTION OF URANIUM BY ELECTROLYSIS OF FUSED SALTS. M. Kolodney, H. L. Slatin, and A. S. Covert. Sept. 28, 1944. Decl. Dec. 8, 1955. 18p. Contract [W-7405-eng-36]. $3.30(ph OTS); $2.40(mf OTS).

Electrolytic uranium of high purity has been prepared in crystalline form. The metal is easily handled and melted. The electrolyte consists of 25 to 30% UCl_3 in a

solvent containing 48% $BaCl_2$, 31% KCl and 21% NaCl. The operating temperature is approximately 630°C. Anodes may be graphite or tungsten. The electrolysis may be carried out at relatively high cathode efficiencies, and with recoveries in excess of 90%. Recommendations are made on cell design and process details. (auth)

2386   LA-149
Los Alamos Scientific Lab., N. Mex.
PREPARATION OF UF_6 FOR ISOTOPIC ANALYSIS. L. J. Roth. Oct. 2, 1944. Decl. Dec. 8, 1955. 12p. Contract [W-7405-eng-36]. $3.30(ph OTS); $2.40(mf OTS).

The preparation of UF_6 using either U_3O_8 on UF_4 as the starting material is described. Greater yields were obtained using UF_4. (C.W.H.)

2387   LA-313
[Los Alamos Scientific Lab., N. Mex.]
PROTECTION OF URANIUM AGAINST ATMOSPHERIC OXIDATION. A. S. Covert and M. Kolodney. June 18, 1945. Decl. Dec. 10, 1955. 13p. [Contract W-7405-eng-36]. $3.30(ph OTS); $2.40(mf OTS).

A method for the protection of against atmospheric oxidation has been developed, and consists of a 600°C diffusion of a thin Ni deposit electroplated on the etched U. The diffusion must be carried out in vacuum for a period of about 30 min. Electroplated coatings, evaporated coatings, chemical and organic films, do not provide adequate oxidation resistance over the necessary period of time, at least in the thicknesses used (~0.0003 inch). (auth)

2388   LA-695
Los Alamos Scientific Lab., N. Mex.
ASSAY OF URANIUM TETRAFLUORIDE. A. L. Henicksman. July 29, 1948. Decl. Dec. 10, 1955. 15p. $3.30 (ph OTS); $2.40(mf OTS).

The ceric sulfate volumetric assay method was evaluated and is recommended for the determination of U in UF_4. An improved end point is described, interfering elements are discussed, and the use of tuballoy for the reagent standardization is suggested. (auth)

2389   LA-1343
Los Alamos Scientific Lab., N. Mex.
CORROSION OF URANIUM IN MOIST AIR. James T. Waber and G. T. Sturdy. Jan., 1952. Decl. Dec. 12, 1955. 12p. $3.30(ph OTS); $2.40(mf OTS).

The corrosion of U by dry and moist air has been studied at 38, 57, and 75°C. Although moisture increases the rate of initial attack, after 200 to 500 hr the effect is reduced and an accelerating corrosion rate overshadows the initial effects of moisture. (auth)

2390   LA-1389
Los Alamos Scientific Lab., N. Mex.
DEPENDENCE OF THE OXIDATION OF URANIUM ON OXYGEN PRESSURE. J. T. Waber. Mar. 20, 1952. Decl. Dec. 12, 1955. 11p. $1.80(ph OTS); $1.80(mf OTS).

The oxidation of U has been studied from the standpoint of the oxygen dependence of the reaction rate in an effort to establish the mechanism. Experimental results support the hypothesis that the rate-controlling step is the migration of cations in the UO_2 lattice, although the observed time dependence is not necessarily in agreement with this conclusion. Experimental entropies of activation are cor-

rected for the observed pressure dependence. No conclusion could be reached as to whether the rate of diffusion or adsorption is rate-controlling. (auth)

2391 LA-1439
Los Alamos Scientific Lab., N. Mex.
OPTICAL PROPERTIES OF SOME COMPOUNDS OF URANIUM, PLUTONIUM AND RELATED ELEMENTS.
Eugene Staritzky and Donald I. Walker. June 6, 1952. Decl. Dec. 13, 1955. 43p. Contract W-7405-eng-36. $7.80(ph OTS); $3.30(mf OTS).

Optical and morphological properties of 28 compounds of U, Pu, Am, and some related elements, belonging to 21 isomorphous groups, are described. Additional data are given on 5 compounds of similar type described in the National Nuclear Energy Series, Division IV, Volume 14A, Chapter 19, "Actinide Elements." (auth)

2392 MITG-208
Massachusetts Inst. of Tech., Cambridge. Mineral Engineering Lab.
THE SELF-ABSORPTION OF BETA RADIATION FOR THE DISCRIMINATION BETWEEN THORIUM AND URANIUM.
James H. Pannell, James B. Partick, and Emilia M. Rubino. Jan. 21, 1949. Decl. Dec. 5, 1955. 16p. Contract AT-30-1-gen-211. $3.30(ph OTS); $2.40(mf OTS).

A radiometric method is presented for the co-determination of Th and U in low-grade ores, and consists of measuring the differences between the counting rates of a sample at two depths, both being infinite for the beta particles. The difference is a measure of gamma activity present in the sample and its relationship to the beta activity is used to determine the Th and U contents. Very limited accuracy was obtained. (C.W.H.)

2393 RL-4.6.260
[California. Univ., Berkeley. Radiation Lab.]
PRODUCTION OF PURE TUBALLOY METAL BY THE HOT FILAMENT METHOD. C. H. Prescott, Jr. and J. A. Holmes. Apr. 27, 1944. Decl. Dec. 6, 1955. 20p. $4.80 (ph OTS); $2.70(mf OTS).

The deposition of U on a tungsten filament using UI_4 as a charge material is described. Critical temperatures were determined for several vapor pressures of UI_4. (C.W.H.)

2394 RL-4.6.265
[California. Univ., Berkeley. Radiation Lab.]
PRODUCTION OF TUBALLOY METAL BY THE HOT FILAMENT METHOD USING TBr_4. F. L. Reynolds and J. A. Holmes. June 5, 1944. Decl. Dec. 6, 1955. 4p. $1.80(ph OTS); $1.80(mf OTS).

The production of U on a hot tungsten filament, using UBr_4 as a charge material is possible at temperatures above the melting point of U. Deposition filament temperatures were determined for two separate pressures of UBr_4. They are approximately 1800 and 1975°K for pressures of 7×10^{-3} and 6×10^{-1} respectively. (auth)

2395 RL-4.6.321
California. Univ., Berkeley. Radiation Lab.
THE SOLUBILITY AND SOLUBILITY PRODUCT OF TUBALLOUS OXALATE. E. L. Wagner. Aug. 21, 1943. Decl. Dec. 6, 1955. 4p. $1.80(ph OTS); $1.80(mf OTS).

The most probable value for the solubility product of $U(C_2O_4)_2 \cdot 6H_2O$ at room temperature, as determined by visual, precipitation, and solubility methods, is 7×10^{-24}.

The solubility of the oxalate in $2\underline{N}$ HCl solution is 48 mg U /liter. (C.W.H.)

Refer also to abstracts 2272 and 2333.

WASTE DISPOSAL

2396 CF-52-3-34
Oak Ridge National Lab., Tenn.
A STUDY OF THE EFFECT OF COOLING WATER TEMPERATURE ON HEAT TRANSFER BY NATURAL CONVECTION IN FIRST CYCLE WASTE TANKS WM-100, WM-101, AND WM-102. W. L. Carter. Mar. 7, 1952. Decl. Dec. 15, 1955. 20p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

Results are presented from a study of the effect of cooling water temperature on heat transfer by natural convection in first cycle waste tanks. (C.H.)

2397 CN-527
[Chicago. Univ. Metallurgical Lab.]
WASTE DISPOSAL FROM EXTRACTION PLANTS. W. A. Rodger. Mar. 20, 1943. Decl. Dec. 12, 1955. 17p. (A-664). $3.30(ph OTS); $2.40(mf OTS).

Methods for the concentration and disposal of untreated fluoride process wastes are considered. Principal attention is given to the wet fluoride process, and optimum conditions for precipitate settling, corrosion, and pH are discussed. (K.S.)

2398 HW-17775
Hanford Works, Richland, Wash.
APPARENT VISCOSITY OF SIMULATED UNDERGROUND METAL WASTE SLURRIES. A. W. Allen. June 20, 1950. Decl. Dec. 8, 1955. 19p. Contract W-31-109-eng-52. $3.30(ph OTS); $2.40(mf OTS).

Apparent viscosity data of sufficient accuracy for pipe line design were obtained for fission product and plutonium free slurries, consisting of simulated Bismuth Phosphate Process wastes, in 0.5 and 1 in. ips iron pipes 21 ft long. Slurries having supernate/settled sludge volume ratios from 0.44 to 5.85 were used. Apparent viscosities of the slurries ranged from 1.72 centipoises at 3.79 ft/sec velocity and 4.15 supernate/sludge volume ratio in 1 in. ips iron pipe to 6.45 centipoises at 3.39 ft/sec velocity and 1.17 supernate/sludge volume ratio in 0.5 in. ips iron pipe. The apparent viscosities of the slurries approach that of the supernate with velocities above 3.5 ft/sec in 1 in. ips pipe and 7 ft/sec in 0.5 in. ips pipe. The apparent viscosity of the slurries increases with decrease of velocity below 3.5 ft/sec in 1 in. ips pipe and 7 ft/sec in 0.5 in. ips pipe. The sludge consisted of two distinct types of solids, one finely divided and slow settling, and the other of large chunks somewhat crystalline in nature and difficult to break up and disperse by agitation. (auth)

2399 HW-18476
Hanford Works, Richland, Wash.
APPARENT VISCOSITY OF NEUTRALIZED AND CONCENTRATED RAW SLURRY—TBP HW-NO. 4 FLOWSHEET. A. W. Allen. Aug. 15, 1950. Decl. Dec. 3, 1955. 13p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

Viscosity data for flow in 1-in. iron pipe were obtained for a fission-product and plutonium-free slurry, consisting of simulated TBP Waste Metal Recovery Process

waste (TBP-HW No. 4 Flowsheet), concentrated to a
saturation point of 82.5 to 85°C. The apparent viscosity
appeared to increase rapidly with decreased flow rate when
in viscous flow. The slurry consisted of two distinct types
of solids, one finely divided, flocculent, slow settling
$Fe(OH)_3$, and the other a white crystalline, rapidly settling
material composed of Na_2SO_4, Na_3PO_4, and $NaNO_3$.
Although the crystalline material settled rapidly, it was
easily and quickly dispersed by agitation. (C.H.)

ENGINEERING

2400   A-3784

[General Electric Co.] General Engineering Lab.,
   Schenectady, N. Y.
MAGNETIC THRUST BEARING. William D. Williams.
June 27, 1944. Decl. Nov. 28, 1955. 9p.
   Included are attachments by W[illiam] D. Williams (Dec.
1, 1943; 3p.) and B. M. Smith (Oct. 30, 1943; 4p.). $3.30
(ph OTS); $2.40(mf OTS).
   A magnetic thrust bearing capable of supporting a
rotating load of 100 lbs is described and illustrated.
(M.P.G.)

2401   K-137

Carbide and Carbon Chemicals Corp. K-25 Plant, Oak
   Ridge, Tenn.
TAYLOR DOUBLE FILLED TUBE SYSTEMS. A. H.
Fowler. Feb. 16, 1948. Decl. Nov. 28, 1955. 6p. Con-
tract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).
   An investigation was made to determine the feasibility of
refilling and changing the range from 20 to 130°F to the new
range of 50 to 170°F of the Taylor Vapor Tension double-
filled tube systems as used on the cell coolant control. The
pressure-temperature relationship for the 50 to 170°F bulbs
indicated that the operating fluid could be either methyl
chloride or methyl ether. The transmission fluid was
identified as glycerine. Since methyl chloride and
glycerine satisfied the requirements for a tube system
with a range from 50 to 170°F, a salvaged bulb was filled
with these fluids. Calibration was obtained with ease, and
response to temperature change compared very favorably
with the new bulb systems. As a result, a procedure was
written for refilling and changing the range if the tube
system is in good condition, and another procedure for tube
systems which have been damaged. (auth)

HEAT TRANSFER AND FLUID FLOW

2402   A-4254

[Knolls Atomic Power Lab., Schenectady, N. Y.]
MEMO ON HEAT CONDUCTIVITY IN LAMINATED FUEL
STRUCTURES. Henry Hurwitz, Jr. Dec. 19, 1946. Decl.
Dec. 8, 1955. 17p. (GE-HH-5). $3.30(ph OTS); $2.40
(mf OTS).
   Equations for the temperature distribution of fuel rods
made up of alternate discs of fuel material and diluent are
derived. Applications are discussed for the case of U
fuel discs and Be diluent discs, rates of heat flow from
discs, temperature distributions in a fuel plate made up of
long thin strips of fuel material and diluent. Equations for
computing the thermal stresses in fuel rods are given.
(J.E.D.)

MATERIALS TESTING

2403   AECD-3812

Vitro Corp. of America, New York.
SUMMARY REPORT OF THE GASKET DEVELOPMENT
PROGRAM. JOB 15. E. W. Ruhl. Aug. 29, 1951. Decl.
with deletions Dec. 6, 1955. 66p. Project C-187-D. Con-
tract W-31-109-eng-52, Subcontract G-148. $10.80(ph
OTS); $3.90(mf OTS).
   The general development program was undertaken to
establish designs and find materials for gaskets which
would withstand the severe specialized service conditions
imposed by radioactive material processing facilities.
Specifically, the objective of this phase of the program
was to continue development of gaskets which would be
dimensionally stable, reusable, resistant to intense
radioactive radiation and would provide a positive seal
for a long period under such conditions. The data pre-
sented here are intended for use in connection with
operation of the Redox Plant and to serve as a basis for
future development work. (auth)

2404   K-276

Massachusetts Inst. of Tech.. Oak Ridge, Tenn. Engi-
   neering Practice School.
CORRELATION OF THE PHYSICAL PROPERTIES OF
FLUOROTHENE WITH TEMPERATURE AND PRESSURE
OF MOLDING. A. E. Johnson and T. Cantwell. Aug. 13,
1948. Decl. Nov. 29, 1955. 23p. For Carbide and
Carbon Chemicals Corp. K-25 Plant. Contract [W-7405-
eng-26], Subcontract 70. $4.80(ph OTS); $2.70(mf OTS).
   A study of the effect of molding pressure and tempera-
ture on the tensile strength, hardness, and transparency of
fluorothene plastic (a polymer of 1, 1, 2 tri-fluoro-2 chloro-
ethylene) revealed that tensile strength is but slightly
affected and that hardness and transparency are not notice-
ably affected at all by changes in these molding conditions.
It was discovered that application of sufficient tensile load
increases the transparency of the fluorothene. (auth)

2405   R52GL51

General Electric Co. General Engineering Lab.,
   Schenectady, N. Y.
SLEEVE BEARING DESIGN DATA. Harry Apkarian.
Mar. 1, 1952. Decl. Nov. 29, 1955. 25p. $4.80(ph OTS);
$2.70(mf OTS).
   The results derived from an investigation to determine
design data for sleeve bearings lubricated with Hanford
process solutions are reported. Two basic types of
bearing materials were tested: metallic materials (boron
carbide and stellite J) and non-metallic materials
(Graphitar 41, Keystone Carbon 353, and 60% carbon
filled fluorothene). The journal materials tested were
stainless steel 304, stellite J and welded stellite No. 6 on
stainless steel 304. Bearing tests are also reported on
Duralon and Epon. Data show that stellite J or boron
carbide bearings have excellent wear and abrasion
resistance but should be used only when conformability is
not required. When misalignment and deflection are
present, the bearing materials most likely to provide the
desired conformability are Graphitar 51 and Keystone
Carbon 353. In the event of limited surface damage to a
bearing, subsequent satisfactory bearing performance is
more likely on non-metallic bearings than on metallic
bearings. The frictional heat attendant to comparative
mild boundary operation is sufficient to cause plastic

deformation of the 60% carbon filled fluorothene bearings. All journal materials operated satisfactorily with non-metallic bearings. Characteristics of Duralon bearings in the hydrodynamic and boundary region are comparable to other bearing materials tested. Epon bearings have comparatively small load carrying capacity in the Hanford solutions. (M.H.N.)

PUMPS

2406 ORNL-25
[Oak Ridge National Lab., Tenn.]
TOTALLY ENCLOSED WATER PUMP. S. Untermyer. Apr. 2, 1948. Decl. Nov. 29, 1955. 4p. Contract W-35-058-eng-71. $1.80(ph OTS); $1.80(mf OTS).

A totally enclosed water pump, using an inductively driven rotor, was built for use with water at 1000 psi and about 500°F. This type pump is applicable wherever low leakage is more important than efficiency. (auth)

MINERALOGY, METALLURGY, AND CERAMICS

2407 NAA-SR-16
North American Aviation, Inc., Los Angeles.
SOME METHODS FOR ANALYSIS OF ANNEALING DATA. F. W. Brown. Jan. 17, 1950. Decl. Dec. 6, 1955. 23p. $4.80(ph OTS); $2.70(mf OTS).

General methods are developed for the analysis of temperature annealing data on changes of the types induced by radiation damage in materials. Methods previously developed for such analysis are critically examined. It is found that the common assumption of a spectrum of activation energies for the relaxation process can be replaced with the simpler assumption of discreet activation energies and still adequately explain many data even though these data be spread over a wide range of temperature and time. (auth)

CERAMICS AND REFRACTORIES

2408 ETL-1
[Bureau of Mines.] Electrotechnical Lab., Norris, Tenn. REFRACTORIES FOR ATOMIC POWER PRODUCTION. A. H. Toepfer, L. C. Weger, M. P. Haydon, L. B. Trotter, and O. Willis. July 31, 1947. Decl. Nov. 28, 1955. 14p. $3.30(ph OTS); $2.40(mf OTS).

Investigations were initiated on the preparation and characteristics of BeO powders of selected grain size. (C.W.H.)

2409 ETL-2
[Bureau of Mines]. Electrotechnical Lab., Norris, Tenn. REFRACTORIES FOR ATOMIC POWER PRODUCTION. A. H. Toepfer, L. C. Weger, M. P. Haydon, L. B. Trotter, and O. Willis. Aug. 31, 1947. Decl. Nov. 28, 1955. 18p. $3.30(ph OTS); $2.40(mf OTS).

Specific gravity, porosity, and spalling tests were carried out on briquettes of various BeO compositions. The effects of addition of fines, plasticizers, previous treat-

ment of BeO, and temperature on these properties at 1650°C were determined. (C.W.H.)

2410 ETL-3 and 4
[Bureau of Mines]. Electrotechnical Lab., Norris, Tenn. REFRACTORIES FOR ATOMIC POWER PRODUCTION. [Period covered] September—October 1947. A. H. Toepfer, M. P. Haydon, L. R. Trotter, and O. Willis. Dec. 2, 1947. Decl. Nov. 28, 1955. 73p. $12.30(ph OTS); $4.50(mf OTS).

The effects of firing at elevated temperatures on the specific gravity, density, and porosity of BeO briquettes were investigated. (C.W.H.)

2411 ETL-5
[Bureau of Mines]. Electrotechnical Lab., Norris, Tenn. REFRACTORIES FOR ATOMIC POWER PRODUCTION. W. W. Galbreath, Jr., B. S. Riordan, M. P. Haydon, L. R. Trotter, D. F. Allen, O. Willis, and A. H. Toepfer. Nov. 30, 1947. Decl. Nov. 28, 1955. 12p. $3.30(ph OTS); $2.40(mf OTS).

Studies were initiated on the pressing and extrusion of beryllia cylinders. The properties of fractional grains (hot-pressed and crushed BeO) were investigated. (C.W.H.)

2412 ETL-6
[Bureau of Mines]. Electrotechnical Lab., Norris, Tenn. REFRACTORIES FOR ATOMIC POWER PRODUCTION. W. W. Galbreath, Jr., B. S. Riordan, W. D. Neely, M. P. Haydon, L. R. Trotter, D. F. Allen, O. Willis, and A. H. Toepfer. Dec. 31, 1947. Decl. Nov. 28, 1955. 16p. $3.30(ph OTS); $2.40(mf OTS).

Work was continued on the selection of organic binders and dust-pressing procedures for the fabrication of BeO bodies. The effect of prepressing on the density of the BeO bodies was investigated. (C.W.H.)

2413 ETL-7
[Bureau of Mines]. Electrotechnical Lab., Norris, Tenn. REFRACTORIES FOR ATOMIC POWER PRODUCTION. W. W. Galbreath, Jr., B. S. Riordan, W. D. Neely, L. R. Trotter, D. F. Allen, O. Willis, and A. H. Toepfer. Jan. 31, 1948. Decl. Nov. 28, 1955. 8p. $1.80(ph OTS); $1.80(mf OTS).

Studies were continued on the effects of firing temperatures and beryllia and beryl powder additions on the physical properties of BeO grain bodies. (C.W.H.)

2414 ETL-8
[Bureau of Mines]. Electrotechnical Lab., Norris, Tenn. REFRACTORIES FOR ATOMIC POWER PRODUCTION. W. W. Galbreath, Jr., B. S. Riordan, W. D. Neely, M. P. Haydon, L. R. Trotter, D. F. Allen, and A. H. Toepfer. Feb. 29, 1948. Decl. Nov. 28, 1955. 21p. $4.80(ph OTS); $2.70(mf OTS).

The effect of prepressing on the physical properties on BeO grain bodies was investigated. The fired properties of briquettes and cylinders were compared. Work was continued on the fabrication of BeO bodies. (C.W.H.)

2415 ETL-9
[Bureau of Mines]. Electrotechnical Lab., Norris, Tenn. REFRACTORIES FOR ATOMIC POWER PRODUCTION. W. W. Galbreath, Jr., B. S. Riordan, W. D. Neely, H. R. Shell, D. F. Allen, O. Willis, L. L. Hall, A. H. Toepfer, and J. M. Mochel. Mar. 31, 1948. Decl. Nov. 28, 1955. 12p. $3.30(ph OTS); $2.40(mf OTS).

Work was continued on the fabrication of BeO grain bodies. The effectiveness of HCl, HNO_3, H_2SO_4, and $H_2C_2O_4$ for the removal of Fe from BeO was evaluated. (auth)

2416   ETL-10

[Bureau of Mines]. Electrotechnical Lab., Norris, Tenn.
REFRACTORIES FOR ATOMIC POWER PRODUCTION.
W. W. Galbreath, Jr., B. S. Riordan, W. D. Neely, D. F.
Allen, L. R. Trotter, A. H. Toepfer, and J. M. Mochel.
Apr. 30, 1948, Decl. Nov. 28, 1955. 7p. $1.80(ph OTS);
$1.80(mf OTS).

Dry and fired properties of pressed BeO cylinders were
investigated. (C.W.H.)

2417   ETL-11

[Bureau of Mines]. Electrotechnical Lab., Norris, Tenn.
REFRACTORIES FOR ATOMIC POWER PRODUCTION.
W. W. Galbreath, Jr., B. S. Riordan, W. D. Neely, J. L.
Day, D. F. Allen, A. H. Toepfer, and J. M. Mochel. May
31, 1948. Decl. Nov. 28, 1955. 11p. $3.30(ph OTS);
$2.40(mf OTS).

The effect of process variables, including precalcination
of the BeO, on the firing volume expansion of bodies con-
taining refractory-grade BeO was studied. (C.W.H.)

2418   ETL-12

[Bureau of Mines]. Electrotechnical Lab., Norris, Tenn.
REFRACTORIES FOR ATOMIC POWER PRODUCTION.
W. W. Galbreath, Jr., B. S. Riordan, W. D. Neely, D. F.
Allen, J. L. Day, L. N. Dockery, E. E. Dwyer, and A. H.
Toepfer. June 30, 1948. Decl. Nov. 28, 1955. 12p.
$3.30(ph OTS); $2.40(mf OTS).

The effect of particle size of BeO on the resistance
of coarse-grain beryllia bodies to thermal rupture was
investigated. Test cylinders of various BeO compositions
were fabricated (C.W.H.)

2419   ETL-13

[Bureau of Mines]. Electrotechnical Lab., Norris, Tenn.
REFRACTORIES FOR ATOMIC POWER PRODUCTION.
W. W. Galbreath, Jr., B. S. Riordan, W. D. Neely, D. F.
Allen, E. S. Huff, and A. H. Toepfer. July 31, 1948.
Decl. Nov. 28, 1955. 11p. $3.30(ph OTS); $2.40(mf OTS).

The effects of precalcination of the grain and tempera-
ture, time, and atmosphere on the firing expansion of BeO
bodies were investigated. (C.W.H.)

2420   ETL-14 and 15

[Bureau of Mines]. Electrotechnical Lab., Norris, Tenn.
REFRACTORIES FOR ATOMIC POWER PRODUCTION.
[Period covered] August—September 1948. W. W. Gal-
breath, Jr., B. S. Riordan, K. G. Skinner, M. P. Haydon,
D. F. Allen, L. R. Trotter, O. Willis, and A. H. Toepfer.
Nov. 15, 1948. Decl. Nov. 28, 1955. 11p. $3.30(ph OTS);
$2.40(mf OTS).

Studies were continued on the firing expansion of re-
fractory-grade BeO grain, and the resistance to thermal
rupture of test cylinders. (C.W.H.)

2421   ETL-16 and 17

[Bureau of Mines]. Electrotechnical Lab., Norris, Tenn.
REFRACTORIES FOR ATOMIC POWER PRODUCTION.
[Period covered] October—November 1948. W. W.
Galbreath, Jr., B. S. Riordan, K. G. Skinner, M. S. Grim,
Jr., M. P. Haydon, D. A. Allen, L. R. Trotter, and A. H.
Toepfer. Dec. 8, 1948. Decl. Nov. 28, 1955. 5p. $1.80
(ph OTS); $1.80(mf OTS).

Studies were initiated on the evaluation and development
of semi-conducting bodies which can be fabricated into
cellular shapes of various cross-sectional design.
(C.W.H.)

2422   ETL-18

Bureau of Mines. Electrotechnical Lab., Norris, Tenn.
REFRACTORIES FOR ATOMIC POWER PRODUCTION.
[Period covered] December 1948—January 1949. M. S.
Grim, Jr., B. S. Riordan, K. G. Skinner, M. P. Haydon,
L. R. Trotter, D. A. Allen, O. Willis, A. H. Toepfer, and
W. W. Galbreath, Jr. Mar. 3, 1949. Decl. Nov. 29, 1955.
19p. $3.30(ph OTS); $2.40(mf OTS).

Studies were continued on the development of semi-
conducting bodies. The effects of silicon carbide or
ferrosilicon additions on the electrical resistance of
calcite and kaolin-base specimens were determined.
(C.W.H.)

2423   ETL-19

Bureau of Mines. Electrotechnical Lab., Norris, Tenn.
REFRACTORIES FOR ATOMIC POWER PRODUCTION.
[Period covered] February—March 1949. M. S. Grim,
Jr., B. S. Riordan, K. G. Skinner, D. A. Allen, A. H.
Toepfer, and W. W. Galbreath, Jr. Apr. 26, 1949.
Decl. Nov. 28, 1955. 17p. $3.30(ph OTS); $2.40(mf OTS).

The electric resistivities of calcite and kaolin-base
bodies containing SiC were determined. Work was con-
tinued on the fabrication of semi-conductors. (C.W.H.)

2424   ETL-20

Bureau of Mines. Electrotechnical Lab., Norris, Tenn.
REFRACTORIES FOR ATOMIC POWER PRODUCTION.
[Period covered] April—July 1949. K. G. Skinner, B. S.
Riordan, D. F. Allen, and W. W. Galbreath. Aug. 31,
1949. Decl. Nov. 28, 1955. 23p. $4.80(ph OTS);
$2.70(mf OTS).

Electrical resistances and physical properties of clay—
SiC bodies are reported. (C.W.H.)

2425   ETL-21

Bureau of Mines. Electrotechnical Lab., Norris, Tenn.
REFRACTORIES FOR ATOMIC POWER PRODUCTION.
K. G. Skinner, B. S. Riordan, G. D. White, D. F. Allen,
and W. W. Galbreath, Jr. Nov. 30, 1949. Decl. Nov. 28,
1955. 15p. $3.30(ph OTS); $2.40(mf OTS).

Studies were continued on the electrical and physical
properties of SiC—clay bodies. (C.W.H.)

2426   ETL-22

Bureau of Mines. Electrotechnical Lab., Norris, Tenn.
REFRACTORIES FOR ATOMIC POWER PRODUCTION.
[Period covered] December 1949—March 1950. K. G.
Skinner, B. S. Riordan, G. D. White, D. F. Allen, and
W. W. Galbreath, Jr. Apr. 30, 1950. Decl. Nov. 28,
1955. 20p. $3.30(ph OTS); $2.40(mf OTS).

Studies were continued on the electrical and thermal
properties of SiC—clay bodies. The addition of kaolin,
feldspar, or $BaCO_3$ to these bodies was also investigated.
(C.W.H.)

2427   ETL-23

[Bureau of Mines]. Electrotechnical Lab., Norris, Tenn.
REFRACTORIES FOR ATOMIC POWER PRODUCTION.
[Period covered] May—June 1950. K. G. Skinner, B. S.
Riordan, G. D. White, D. F. Allen, and W. W. Galbreath,
Jr. Decl. Nov. 28, 1955. 10p. $1.80(ph OTS); $1.80
(mf OTS).

The fabrication and electrical properties of SiC—kaolin
bodies containing BaO or $BaCO_3$ are described. (C.W.H.)

CORROSION

2428   ANL-4991

Argonne National Lab., Lemont, Ill.
ATTACK ON URANIUM BY LITHIUM AT 600°C. Walter
D. Wilkinson and Frank L. Yaggee. Oct. 13, 1950. Decl.
Dec. 10, 1955. 5p. Contract W-31-109-eng-38. $1.80
(ph OTS); $1.80(mf OTS).

Results of tests giving a quick evaluation of the resistance
of U to attack by Li are reported. A U sample, placed in Li
at 600°C for 6 days, shows some increase in dimensions
which can be explained by the presence of Li in the surface.
The maximum observed depth of the reaction zone was
about 0.25 mil. (B.J.H.)

2429   HW-18083

[Hanford Works, Richland, Wash.]
APPLIED POTENTIAL CORROSION OF ALUMINUM.
Final Report. Kenneth L. Sanborn. [1950?]. Decl. Dec.
5, 1955. 3p. Contract [W-31-109-Eng-52]. $1.80(ph OTS);
$1.80(mf OTS).

A preliminary test program was completed for the
purpose of determining the order of magnitude of corrosion
rates to be expected of Al alloys when exposed under
applied potentials in condensate water. Data obtained from
dynamic tests are presented. In general, the corrosion
rates were much lower under dynamic conditions than
under the static conditions tested previously. However, the
static tests were run at 70°C rather than at room tempera-
ture. There was no evidence that the cathode becomes
passivated. In fact, the cathode in each case suffered a
higher corrosion rate than the anode. Attack at the cathode
was uniform in each case, whereas pitting occurred at
each of the anodes. The data are tabulated. Bakelite var-
nish #17656 failed by cracking along the sample edges in
the dynamic tests, and failed by blistering in the autoclave
tests. Two Heresite-coated samples successfully with-
stood 40 hr of autoclave exposure. (auth)

2430   HW-21520

Hanford Works, Richland, Wash.
CORROSION OF STAINLESS STEELS BY CONCENTRATED
UNH SOLUTIONS. K. L. Sanborn. July 3, 1951. Decl.
Dec. 3, 1955. 8p. Contract [W-31-109-Eng-52]. $1.80
(ph OTS); $1.80(mf OTS).

Stainless steels types 309 SCb and 304 ELC were
tested for corrosion in UNH solutions boiling at 230°F and
in the range 270 to 290°F. Types 309S, Carpenter 20, 309
SCb, and 304 ELC were tested in UNH solutions in the
range 244 to 255°F. The performance of Esco 40-T, an
alloy of 18-12 chromium-nickel content, was compared to
309 SCb in concentrated UNH solution at 300°F. (auth)

2431   HW-23314

[Hanford Works, Richland, Wash.]
CORROSION OF ALUMINUM IN ALUM COAGULATED
PROCESS WATER. R. S. Dalrymple. Jan. 22, 1952.
Decl. Nov. 29, 1955. 4p. Contract [W-31-109-eng-52]
$1.80(ph OTS); $1.80(mf OTS).

Results are reported from a test of the effects of the
coagulants, Ferrofloc and alum, on the corrosion rates of
Al slug jacket alloy and 72S. Analytical data on the water
used are included. (C.H.)

2432   HW-25337

[Hanford Works, Richland, Wash.]
CORROSION TEST OF TYPE 502 STAINLESS STEEL.

D. L. Zimmerman. Aug. 13, 1952. Decl. Nov. 29, 1955.
4p. Contract [W-31-109-Eng-52]. $1.80(ph OTS);
$1.80(mf OTS).

Eight samples of type 502 stainless steel, four non-
welded and four welded with type 347 stainless steel, were
immersed in flowing pile filtered water at a temperature
of 80°C. After an exposure period of 33 days, the samples
were removed, electrically cleaned in a 10% sodium
cyanide electrolyte, and examined. Preliminary observa-
tions are reported. (C.H.)

2433   HW-26323

Hanford Works, Richland, Wash.
INVESTIGATION OF SULFAMIC ACID TANK VALVE
FAILURES. N. Endow. Nov. 21, 1952. Decl. Dec. 7,
1955. 5p. [Contract W-31-109-eng-52.] $1.80(ph OTS);
$1.80(mf OTS).

The failure of stainless steel valves in sulfamic acid due
to corrosion was attributed in part to the amount of ferrite
in the austenitic matrix. Type 304 ELC steel was rec-
ommended as a substitute material for tank valves used in
sulfamic acid solutions. (C.W.H.)

METALS AND METALLURGY

2434   AECD-3800

Knolls Atomic Power Lab., Schenectady, N. Y.
TECHNICAL INFORMATION ON SOME RARER METALS
OF HIGH MELTING POINT. Pauline Barrett and Alan U.
Seybolt. Nov. 29, 1948. Decl. with deletions Dec. 5, 1955.
12p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40
(mf OTS).

A listing of some of the pertinent properties of
promising materials which do not form low melting alloys
or brittle intermetallic compounds with uranium, and
which would be ductile enough to be fabricated in the form
of small tubing is given. Enough is known about the be-
havior of chromium to rule it out from a metallurgical
standpoint, but it is included for purposes of comparison,
and like some of the other elements listed, it is
comparatively unfamiliar as a base material for
structural use. This report is written from the viewpoint
of the metallurgist, with primary attention to alloying
behavior with uranium and the fabrication possibilities of
the various metals. A table of the more pertinent en-
gineering and physical data is first presented, followed by
a more detailed account of a page or two. The various
constants were selected as far as possible from what
appeared to be the most reliable sources. (auth)

2435   AECD-3803

Massachusetts Inst. of Tech., Cambridge. Metallurgical
    Project.
FACTORS AFFECTING PROPERTIES OF EXTRUDED
COMPACTS OF CRYSTAL BAR ZIRCONIUM. S. V.
Arnold. June 10, 1949. Decl. with deletions Dec. 5,
1955. 9p. $1.80(ph OTS); $1.80(mf OTS).

Copper-clad billets of Zr compacted from $\frac{1}{2}$-in. lengths
of crystal bar under 130,000 psi at 900°C were extruded
at the same temperature at 7.9:1, 14:1, and 31.6:1
reduction ratios. Unbonded interfaces were found over

the entire cross section of the 7.9:1 reduced sounds, but for higher reductions lack of bonding was closely relegated to surface over near surface interfaces. The properties of tensile specimens fashioned from the rounds are listed and presented graphically. Increase in properties appears associated with transformation into the β phase during extrusion. (auth)

2436   AECD-3828
Bridgeport Brass Co., Conn.
TECHNICAL PROGRESS REPORT FOR THE PERIOD JULY 16 THROUGH AUGUST 15, 1953. R. M. Treco. Aug. 21, 1953. Decl. with deletions Dec. 13, 1955. 16p. Contract AT(30-1)1405. $3.30(ph OTS); $2.40(mf OTS).

Tests were made to determine the alloying behavior of Cu-base cladding alloys with Zircaloy at the extrusion temperature, preparatory to extruding the Zircaloy. (L.M.T.)

2437   BMI-65
Battelle Memorial Inst., Columbus, Ohio.
THE THERMAL AND ELECTRICAL CONDUCTIVITIES OF ZIRCONIUM AND ITS ALLOYS. George Bing. Apr. 16, 1951. Decl. Dec. 12, 1955. 19p. Contract W-7405-eng-92. $3.30(ph OTS); $2.40(mf OTS).

Data available at Battelle on the thermal and electrical conductivities of Zr and a number of alloys of Zr with Sn, U, and Ta are compiled. A calculation has been made to correlate thermal and electrical conductivities with a view toward predicting thermal conductivities from the more easily measured electrical conductivities. A calculation by the method of least squares indicates that the relation $K = 0.308\,(\sigma - 0.00327)\,T + 0.0381$ best fits the available data. In the equation, K is in watt/cm/°C, σ is in $(\mu\ ohm\text{-}cm)^{-1}$, and T is the Kelvin temperature. This relation enables thermal conductivities to be predicted from electrical conductivities with a maximum probable error of about 5%. (J.E.D.)

2438   BMI-744
Battelle Memorial Inst., Columbus, Ohio.
CURSORY ATTEMPTS TO WELD HAFNIUM TO STELLITE AND STAINLESS STEEL. D. R. Kelker, P. J. Rieppel, and C. B. Voldrich. May 13, 1952. Decl. Dec. 13, 1955. 17p. Contract W-7405-eng-92. $3.30(ph OTS); $2.40(mf OTS).

A limited investigation was made to determine if hafnium could be welded to Stellite 6, Stellite 21, and 347 stainless steel by the inert-gas-shielded tungsten-arc process. The investigation was limited to a series of trials without the developmental work that might have solved the problems encountered. The results were not favorable; no sound welds were made between Hf and any of the base materials studied. Sound butt joints were made between pieces of Hf using Hf filler rod. These joints were made as control experiments. (auth)

2439   BMI-766
Battelle Memorial Inst., Columbus, Ohio.
CREEP OF 2S-O ALUMINUM SHEET AT 500 and 550 C. J. A. VanEcho, W. F. Simmons, and H. C. Cross. Sept. 11, 1952. Decl. Dec. 9, 1955. 19p. Contract W-7405-eng-92. $3.30(ph OTS); $2.40(mf OTS).

Creep and creep-rupture tests were made on 2S-O aluminum sheet at temperatures of 500 and 550°C. The estimated stresses that will produce 0.5% deformation and rupture in 10,000 hr at 400, 450, 500, and 550°C are as follows:

Condition of Test at 10,000 Hours	Stress in psi at Temperature C			
	400	450	500	550
0.5% Elongation	250	200	215	130
Rupture	300	210	220	150

(auth)

2440   BNL-1798
Brookhaven National Lab., Upton, N. Y.
LMFR PROGRESS LETTER FOR MARCH 1954. F. T. Miles. Apr. 15, 1954. Decl. Dec. 12, 1955. 3p. [Contract AT-30-2-gen-16]. $1.80(ph OTS); $1.80(mf OTS).

The solubilities of Zr in liquid Bi are listed for various temperatures. The status of corrosion loop tests with stainless steel and Croloy loops containing U−Bi with and without additions of Mg and Zr is summarized. Experiments on the separation of Th and U from Bi and of Pa from alloys of irradiated Th in Bi are described. (M.P.G.)

2441   CT-890
[Chicago. Univ.] Metallurgical Lab.
TECHNOLOGICAL RESEARCH—METALLURGY. PART I OF REPORT FOR MONTH ENDING AUGUST 28, 1943. Decl. Dec. 13, 1955. 40p. (A-1185). $6.30(ph OTS); $3.00(mf OTS).

2442   HW-23581
Hanford Works, Richland, Wash.
PROCESS TUBE PRESSURE—STRESS FACTORS. James J. Cadwell. Feb. 21, 1952. Decl. Dec. 2, 1955. 6p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

Five theories of process tube failure are discussed briefly and are presented in graphical form. It is shown that if the longitudinal stress in a process tube is tensile in nature, then the selection of a working pressure based on the intensity of the hoop stress alone may be slightly conservative. If bending action, or thermal stresses arising from stuck gun barrels should cause the longitudinal stress to be compressive, then the selection of a suitable working pressure based only on the hoop stress is unsafe. It is felt that the latter state of stress is a distinct possibility in the older piles, and is a rather remote possibility in the newer piles. It is recommended that a program be initiated to determine fully the influence of the longitudinal stress on the allowable working pressure. (auth)

2443   LA-42
Los Alamos Scientific Lab., N. Mex.
URANIUM ALLOY DEVELOPMENT. A. U. Seybolt, C. S. Smith, and L. B. Stark. Nov. 9, 1943. Decl. Dec. 13, 1955. 28p. Contract [W-7405-eng-36]. $4.80(ph OTS); $2.70 (mf OTS).

Alloys of U were made containing 5% by weight of each of the following elements: Fe, Ni, Co, W, Cu, Mo, Cr, Ag, Nb, Mn, Ta, Pt, Ti, Zr, and Th. Of the alloys investigated, uranium with about 5% Mo appeared to offer most promise, as it was susceptible to hardening by heat treatment. The microstructure indicated the presence of relatively extensive solubility, and indicates that a considerable improvement of strength by heat treatment should be

possible. Preliminary experiments on the preparation of one gram heats of U were not successful. (auth)

2444   LA-78

[Los Alamos Scientific Lab., N. Mex.]
URANIUM ALLOY DEVELOPMENT. PART VI. URA-
NIUM—MOLYBDENUM ALLOYS. A. U. Seybolt and L. B.
Stark. May 11, 1944. Decl. Dec. 13, 1955. 11p. Con-
tract [W-7405-eng-36]. $3.30(ph OTS); $2.40(mf OTS).

Uranium alloys containing 0.71 to 3.12% Mo have been
examined in a number of different heat treatments, and a
tentative phase diagram for this concentration region has
been prepared. The most promising heat treatable alloy
contains about 2% Mo, and the optimum strength proper-
ties are developed after quenching in water from 700°C
followed by a one hour treatment at 300°C. The modulus of
elasticity in the 700°C quenched state is little over half
that of the alloy in the fully hardened condition. (auth)

2445   NAA-SR-58

North American Aviation, Inc., Los Angeles.
PROPOSED EXPERIMENTS FOR STUDYING THE IN-
FLUENCE OF IRRADIATION ON INTERMETALLIC DIF-
FUSION. Pol Duwez. Jan. 5, 1950. Decl. Dec. 6, 1955.
17p. $3.30(ph OTS); $2.40(mf OTS).

A technique is described which is especially suitable for
the measurement of intermetallic diffusion in samples ex-
posed to irradiation. Experiments to determine the effects
of reactor and cyclotron irradiation on the diffusion rate in
copper—gold and copper—nickel systems are outlined; and
useful curves, helpful in the interpretation of such experi-
ments, are presented. (auth)

2446   NYO-110(Del.)

New York Operations Office. Special Materials Div.,
AEC.
BERYLLIUM AND BERYLLIUM OXIDE PRODUCTION
AND DEVELOPMENT. Nov. 21, 1949. Changed from
OFFICIAL USE ONLY with deletions Feb. 9, 1956. 215p.
$33.30(ph OTS); $9.60(mf OTS).

Production methods for producing Be and BeO, and
methods of production in the development stage are
discussed. (auth)

2447   NYO-1127

Sylvania Electric Products Inc., Bayside, N. Y.
AN INVESTIGATION INTO THE POWDER METALLURGY
PROCESSING OF ZIRCONIUM DI-HYDRIDE AND ZIR-
CONIUM POWDERS PREPARED FROM ZIRCONIUM
CRYSTAL BAR. R. P. Angier and H. H. Hausner. Apr.
10, 1950. Decl. Dec. 5, 1955. 29p. Contract AT-30-1-
GEN-366. $4.80(ph OTS); $2.70(mf OTS).

Zirconium metal articles can be prepared by the powder
metallurgy technique from both Zr and ZrH_2 powders.
Both the briquetted ZrH_2 and Zr powders prepared from
Zr crystal bar by the hydride process attained the density
of Zr metal during sintering at temperatures 600 to 645°C
below the melting point of Zr. The ZrH_2 powder proved
better in the powder metallurgy processing than the Zr
powder; briquettes of the hydride sintered to the density of
Zr at lower temperatures in shorter times, they were more
ductile, and the hydride powder was much less pyrophoric.
Sintered Zr, although somewhat harder than crystal bar
Zr possesses excellent ductility and can be readily cold
worked. (auth)

Refer also to abstract 2349.

PHYSICS

2448   A-502

Bureau of Mines. Pacific Experiment Station, Berkeley,
Calif.
HIGH TEMPERATURE HEAT CONTENT DATA FOR
THREE SOLID SUBSTANCES. George E. Moore. Dec.
31, 1942. Decl. Dec. 7, 1955. 8p. Contract OEMst-412.
(1D R-3). $1.80(ph OTS); $1.80(pf OTS).

Determinations of the heat contents above 25°C of U,
UO_2, and UO_3 and tabulation of the data are presented.
(J.E.D.)

2449   AECD-3789

Phillips Petroleum Co. Atomic Energy Div., Idaho
Falls, Idaho.
MTR TECHNICAL QUARTERLY REPORT [FOR] FIRST
QUARTER—1954. J. R. Huffman. July 9, 1954. Decl.
with Deletions Dec. 5, 1955. 24p. Contract AT(10-1)-
205. $4.80(ph OTS); $2.70(mf OTS).

Thermal and fast neutron flux measurements in the MTR
are reported. The use of Bi as a thermal flux monitor and
S as a fast flux monitor is being tested. A nondestructive
fuel assaying technique has been demonstrated to apply to
the analysis of Chemical Processing Plant product
solutions of U^{235}. Total cross sections for Hf have been
obtained on the crystal spectrometer. Results of stored
energy measurements on irradiated graphite samples are
tabulated. Activation cross sections have been obtained for
the A + 1 species of Y and Pr, and decay curves are
given. Criticality calculations are reported for the
Reactivity Measurement Facility. (M.P.G.)

2450   CF-47-12-58

[Oak Ridge National Lab., Tenn.]
TESTING OF AN ELECTROMAGNET. T. H. Mauney.
Nov. 17, 1947. Decl. Nov. 28, 1955. 9p. $1.80(ph OTS);
$1.80(mf OTS).

2451   RL-28.5.120

[California. Univ., Berkeley. Radiation Lab.]
SUMMARY OF THE RESEARCH PROGRESS MEETING.
R. K. Wakerling. Sep. 5, 1946. Decl. Nov. 28, 1955. 5p.
Contract W-7405-eng-48. $1.80(ph OTS); $1.80(mf OTS).

A method for producing Be foils 18 μin. in thickness and
$\frac{1}{2}$ in. in diameter has been found. Results of tests of the
strength of the foils are reported. The foils will be used
on the drift tubes of the linear accelerator. Measurements
of the magnet of the 184-in. synchrocyclotron are
described. Measurements are being made of the amount
of radioactive material necessary to produce regression
and disappearance of a tumor when injected directly into
breast tumors in mice. (M.P.G.)

2452   RL-28.5.121

[California. Univ., Berkeley. Radiation Lab.]
SUMMARY OF THE RESEARCH PROGRESS MEETING.
R. K. Wakerling. Oct. 3, 1946. Decl. Nov. 28, 1955. 5p.
Contract W-7405-eng-48. $1.80(ph OTS); $1.80(mf OTS).

Tests of the magnetic field in the gap of the 184-in.
synchrocyclotron have continued, and data are reported.
The health physics program to study health hazards from
radiation which will arise from the synchrocyclotron is
described. A status report on the 40-ft linear accelerator
is presented. (M.P.G.)

2453   RL-28.5.139

California. Univ., Berkeley. Radiation Lab.
SUMMARY OF THE RESEARCH PROGRESS MEETING.
R. K. Wakerling. May 8, 1947. Decl. Nov. 28, 1955. 5p.
Contract W-7405-eng-48. $1.80(ph OTS); $1.80(mf OTS).

Development work on the 184-in. synchrocyclotron and
the linear accelerator is summarized. Installation of a
crystal counter employing a silver chloride crystal in the
neutron field of the synchrocyclotron is described.(M.P.G.)

2454   RL-28.5.144

[California. Univ., Berkeley. Radiation Lab.]
SUMMARY OF THE RESEARCH PROGRESS MEETING.
Inez O'Brien. July 10, 1947. Decl. Nov. 29, 1955. 5p.
Contract W-7405-eng-48. $1.80(ph OTS); $1.80(mf OTS).

Design and operation of a 40-ft section of a linear
accelerator are reported, and difficulties encountered are
discussed. The total number of neutrons produced by a
neutron beam when it strikes a scatterer is being de-
termined by measuring the distribution of the neutrons in
water. Attempts to determine the definition of a neutron
beam as it comes out of a collimating system are
described. (M.P.G.)

2455   Y-1

Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak
    Ridge, Tenn.
THE COPPER-PLATING OF CARBON PARTS. R. O.
Hutchison and C. B. Graham. Oct. 15, 1947. Decl. Dec.
6, 1955. 12p. Contract W-7405-eng-26. $3.30(ph OTS);
$2.40(mf OTS).

An investigation is carried out to develop a method of
copper-plating experimental carbon parts. A fine-
grained, adherent plate was obtained by the addition of a
colloid and agitating the usual acid−sulfate electrolyte.
(auth)

Refer also to abstract 2570.

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

2456   CN-2069

[Chicago. Univ.]. Metallurgical Lab.
X-RAY DIFFRACTION STUDIES OF PLUTONIUM COM-
POUNDS. W. H. Zachariasen. Aug. 1944. Decl. Dec.
15, 1955. 37p. (A-3011). $6.30(ph OTS); $3.00(mf OTS).

2457   FMPC-310

National Lead Co. of Ohio, Cincinnati.
AN INTERNAL STANDARD FOR THE DETERMINATION
OF THE PROPORTIONALITY CONSTANT IN PREFERRED
ORIENTATION STUDIES. Peter R. Morris. Aug. 17,
1953. Decl. Dec. 22, 1955. 8p. Contract AT(30-1)-1156.
$1.80(ph OTS); $1.80(mf OTS).

A method is presented for the determination of "ρ"
values using the relative calculated intensities and
observed intensities. The method is based on the
supposed constancy of the summation of "ρ" values for a
large number of reflections. Data obtained from Hanford
Works are used to test the validity of this assumption.
(auth)

ELECTRICAL DISCHARGE

2458   BP-60

[California. Univ., Berkeley. Radiation Lab.]
HIGH FREQUENCY VACUUM BREAKDOWN TESTS FOR

COPPER AND COPPER PLATES CERAMIC SURFACES.
Philip C. Bettler. Feb. 17, 1947. Decl. Nov. 28, 1955.
7p. Contract [W-7405-eng-48]. $1.80(ph OTS); $1.80
(mf OTS).

In connection with the design of the rotary capacitor for
an f-m cyclotron, high-frequency vacuum breakdown tests
were made for copper-plated zircon surfaces. Comparison
tests were made with solid copper electrodes. The ex-
periments are described, and results show that the curves
for breakdown gap vs. voltage are about the same for
copper-plated zirconium oxide as for solid copper. (B.J.H.)

2459   LRL-160

California Research and Development Co. Livermore
    Research Lab., Livermore, Calif.
THEORY OF DESTRUCTIVE SPARKING IN LARGE
CAVITIES. June 1954. Decl. Dec. 7, 1955. 5p. Con-
tract AT(11-1)-74. $1.80(ph OTS); $1.80(mf OTS).

Destructive sparking in large cavities, such as the MTA
Mark I accelerator, is contrasted to the non-destructive
brush discharge type. The destructive, or double−ended
spark, is due to the copious emission of electrons and
positive ions at opposite electrodes. It is pointed out that
the cleanliness of metal surfaces and the presence of
magnetic fields have a pronounced effect upon the
destructiveness of such sparks. Whereas such magnetic
fields are not present in MTA, it is concluded that
destructive sparks can occur if the proton transit time
between electrodes is comparable to one-half of an r-f
operating cycle. (K.S.)

ELECTRONS

2460   Y-321

Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak
    Ridge, Tenn.
ELECTRONS IN THE CALUTRON ACCELERATION
REGION. C. B. Mills. Aug. 18, 1948. Decl. Dec. 6, 1955.
5p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf
OTS).

Formation and effect of electrons in the calutron ion
acceleration region is discussed. Experiments to check
the effects of eliminating these electrons, with other in-
directly associated experiments show that dumping
electrons in this region has a good effect on calutron ion
production, particularly for close-spaced ion-source units.
(auth)

Refer also to abstract 2479.

GASES

2461   UCRL-2179(Suppl.)

California. Univ., Berkeley. Radiation Lab.
THE SOLUBILITY OF HYDROGEN AND DEUTERIUM IN
VARIOUS SOLVENTS. Chemistry Division Quarterly
Report [for] Dec. 1952, January, February, 1953. M. Cook
and D. N. Hanson. Apr. 13, 1953. Decl. Dec. 8, 1955.
3p. Contract W-7405-eng-48. $1.80(ph OTS); $1.80(mf
OTS).

As part of a program to determine the feasibility of
separating D from H, their relative solubilities in
benzene, heptane, and hexadecafluoroheptane were
measured and tabulated. (B.J.H.)

INSTRUMENTS

2462   AECD-3813
Kellex Corp., New York.
REPORT OF THE INSTRUMENT AND MECHANICAL
DEVELOPMENT DEPARTMENT ON REMOTE CONTROLS
SYSTEMS AND OPTICAL SYSTEMS FOR THE MAINTE-
NANCE CRANE. JOB 15. June 30, 1949. Decl. with
deletions Dec. 6, 1955. 31p. [For General Electric Co.]
Contract W-31-109-Eng-52, Subcontract G-148.
$6.30(ph OTS); $3.00(mf OTS).

The program described proposes the use of a traveling
bridge crane with fixed position, totally-enclosed cab,
as a means for maintaining and repairing the canyon area
of a chemical process plant handling highly radioactive
solutions. View of the canyon cells and their contained
equipment and vessels is furnished by one binocular and
one monocular periscope. Lifting of heavy units is accom-
plished by use of standard trolley hoists. Lifting and
manipulation of light units and the operation of a pneumatic
impact wrench is accomplished by a pair of unique,
rotatable differential hoists. Television, as an alternate
viewing medium, is also discussed herein. (auth)

2463   BP-63
[California. Univ., Berkeley. Radiation Lab.]
A COINCIDENCE CIRCUIT FOR UNEQUAL, 0.1 MICRO-
SECOND PULSES OF LOW AMPLITUDE. Carroll Mills.
Mar. 13, 1947. Decl. Nov. 28, 1955. 4p. Contract W-
7405-eng-48. $1.80(ph OTS); $1.80(mf OTS).

A circuit diagram is given for a double-grid coincidence
circuit for 0.1 μsec pulses with a maximum amplitude
dispersion of 1:10. The operating characteristics are
discussed. (B.J.H.)

2464   N-1372
[Chicago. Univ. Metallurgical Lab.]
WILLIAM HIGINBOTHAM'S COMMENTS ON HIGIN-
BOTHAM SCALERS. Instrument Section Report No.
SC50245. Ernest Wakefield. June 19, 1944. Decl. Nov.
28, 1955. 11p. Contract [W-740-eng-37]. $3.30(ph OTS);
$2.40(mf OTS).

General comments are made, and six circuit drawings
are included. (B.J.H.)

2465   NAA-SR-49
North American Aviation, Inc., Los Angeles.
A CREEP OF METALS APPARATUS FOR USE WITH THE
BERKELEY CYCLOTRON. W. R. Jewell and C. R.
Malmstrom. Dec. 21, 1949. Decl. Dec. 7, 1955. 19p.
AT-11-1-GEN-8. $3.30(ph OTS); $2.40(mf OTS).

The apparatus was constructed for the purpose of com-
paring creep rates of metal specimens before and during
cyclotron irradiations. Preliminary tests indicate that the
apparatus is capable of detecting a change in the rate of
creep of Al of as little as 1% for creep rates around 5 ×
10^{-8} in./sec. (auth)

2466   UCRL-184
California. Univ., Berkeley. Radiation Lab.
MAGNETIC FIELD MEASUREMENTS BY NUCLEAR
RESONANCE. Peter Kafitz. Aug. 20, 1948. Decl. Nov.
28, 1955. 24p. Contract [W-7405-eng-48]. $4.80(ph
OTS); $2.70(mf OTS).

Work done toward the development of a magnetic field
measuring device using the phenomenon of nuclear res-
onance is outlined. This device is based on the fact that

the strength of a magnetic field can be measured by placing
in it a small sample of a substance, in this case the
proton, whose gyromagnetic ratio is known, and detecting
the frequency of its Larmor precession. Various methods,
including the nuclear induction method, the bridge method,
and the time separation method, of detecting the proton
resonance are discussed. It is concluded that, while there
are methods which would work well, the methods require
equipment which is difficult to use. Thus, none of the
proton methods is suited to measurement of a magnetic
field. (B.J.H.)

2467   WAPD-21
[Division of Biology and Medicine]. Radiation Instruments
   Branch, AEC and Westinghouse Electric Corp. Atomic
   Power Div., Pittsburgh.
SYMPOSIUM ON REACTOR INSTRUMENTATION
WESTINGHOUSE ELECTRIC CORPORATION, ATOMIC
POWER DIVISION, JUNE 5-6, 1950. PART II. Decl. Nov.
28, 1955. 158p. $24.30(ph OTS); $7.50(mf OTS).

A symposium is reported on reactor instrumentation.
Among the topics discussed were the design and perform-
ance of ionization chambers, boron coating processes, pile
measurements with logarithmic amplifiers, counting rate
meters, fission chambers, amplifiers and power supplies,
logarithmic counting rate meters, logarithmic amplifiers,
counting rate meter statistics, and the testing and compari-
son of pulse amplifiers. (C.H.)

ISOTOPES

2468   A-146
[California. Univ., Berkeley. Radiation Lab.]
SEARCH FOR ELEMENTS 94 AND 93 IN NATURE.
PRESENCE OF 94^{239} IN PITCHBLENDE. Glenn T.
Seaborg and Morris L. Perlman. Apr. 13, 1942. Decl.
Dec. 7, 1955. 7p. $1.80(ph OTS); $1.80(mf OTS).

A pitchblende concentrate from the Great Bear Lakes
region of Canada was investigated for the presence of Np
and Pu. Chemical procedures are described, and results
indicate that no positive amount of either element could
be conclusively detected. (B.J.H.)

2469   AECD-3799
California Research and Development Co. Livermore
   Research Lab., Livermore, Calif.
CROSS SECTION FOR THE FORMATION OF Be^7 FROM
OXYGEN IRRADIATED WITH HIGH ENERGY DEUTER-
ONS. R. E. Batzel and G. H. Coleman. Sept. 1953. Decl.
with deletions Dec. 5, 1955. 5p. Contract AT(11-1)-74.
$1.80(ph OTS); $1.80(mf OTS).

The cross section for the formation of Be^7 from oxygen
irradiated with high energy deuterons has been deter-
mined. The values are 4.2 mb at 100 Mev, 5.6 mb at 150
Mev, and 5.5 mb at 190 Mev. (auth)

2470   AECD-3830
Carbide and Carbon Chemicals Div. Y-12 Plant, Oak
Ridge, Tenn.
MONTHLY DIVISIONAL INFORMATION MEETING,
ISOTOPE RESEARCH AND PRODUCTION DIVISION, Y-12.
July 21, 1950. Decl. with deletions Dec. 7, 1955. 52p.
$9.30(ph OTS); $3.60(mf OTS).

Calutron operations and isotope separation research are
reviewed. The high-output production of Li^7 is discussed
in more detail. Work on the chemical separation of Li^7,
Ga isotopes, Zr isotopes, Hf isotopes, and C isotopes is

summarized. A survey is made of work done in atomic spectroscopy, including the hyperfine structure of U^{235} and isotope shifts in Li, Sm, and Th samples. Progress on the nuclear-induction program is reported. (B.J.H.)

ISOTOPE SEPARATION

2471   A-750
Columbia Univ., New York. Div. of War Research.
INVESTIGATION OF THE PHOTOCHEMICAL METHOD FOR URANIUM ISOTOPE SEPARATION. H. C. Urey. July 10, 1943. Decl. Dec. 8, 1955. 97p. (2CR-135). $15.30(ph OTS); $5.40(mf OTS).

2472   LAMS-769
Los Alamos Scientific Lab., N. Mex.
ISOLATION OF HIGH ACTIVITIES OF Xe^{135} AT THE OMEGA WATER BOILER. Nathan Sugarman. Aug. 18, 1948. Decl. Dec. 9, 1955. 7p. Contract [W-7405-eng-36]. $1.80(ph OTS); $1.80(mf OTS).

Experiments were made to test the feasibility of isolating high-activity Xe^{135} samples necessary for cross section measurements. The procedure for the preparation of Xe samples is described in detail. Results show that 94% of the activity at the time of isolation was Xe^{135}. Activities of the samples were about 30 curies. (B.J.H.)

2473   Y-242
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
MOTION OF IONS IN ELECTRIC AND MAGNETIC FIELDS ASSOCIATED WITH THE CALUTRON. Raymond Murray and E. D. Shipley. Feb. 23, 1948. Decl. Dec. 8, 1955. 24p. Contract W-7405-eng-26. $4.80(ph OTS); $2.70 (mf OTS).

Methods of calculation of ion motion in several arrangements of electric and magnetic fields are presented with mathematical treatment of four familiar calutron situations. (auth)

2474   Y-411
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
A STUDY OF OPERATIONAL PARAMETERS OF THE CALUTRON. D. S. Ewing, J. R. Patton, and H. W. Savage. Apr. 14, 1949. Decl. Dec. 7, 1955. 33p. Contract W-7405-eng-26. $7.80(ph OTS); $3.30(mf OTS).

Run data sheets for calutron operations in stable isotope separations over a several-year period have been condensed, and are included as an appendix. These data were examined for trends. Most of those found were of the "expected" types. Definite relationships between randomly selected variables were, in general, not evident. The data represents the first comprehensive survey of all stable isotope separations and are valuable, primarily, as a progress report, and to corroborate the knowledge that precise relationships between calutron variables are not readily evident from data in which the same element or charge material appears, at best, only randomly. (auth)

2475   Y-545
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
ELEMENTARY CALUTRON ARC THEORY. C. B. Mills. Aug. 10, 1948. Decl. Dec. 7, 1955. 23p. Contract W-7405-eng-26. $4.80(ph OTS); $2.70(mf OTS).

Calutron plasma phenomena are described and correlated with their causes, from a most elementary point of view. Ion motion, electron motion, ion formation and distribution, potential distribution, light ion requirement, and magnetic field effects are qualitatively discussed and unified in a simple but comprehensive description of the calutron source plasma. (auth)

2476   Y-563
Oak Ridge National Lab., Y-12 Area, Tenn.
WEIGHT LOSS OF HEATED TANTALUM FILAMENTS. C. E. Normand. Feb. 6, 1950. Decl. Dec. 8, 1955. 41p. Contract W-7405-eng-26. $6.30(ph OTS); $3.00 (mf OTS).

Direct measurements have been made of the change in weight of tantalum filaments under various conditions of operation. Factors that can be identified as contributing to the observed weight changes are: gas absorption, the formation of compounds, metallic evaporation, and the driving off of absorbed gases and volatile compounds. Each of these factors is temperature dependent in such a way that the net weight loss is a sharply rising function of temperature at temperatures above 2000°C. Oxygen, even in minute traces, is particularly effective both as an absorbent and in the formation of compounds. (auth)

Refer also to abstracts 2335 and 2460.

MASS SPECTROGRAPHY

2477   .Y-27
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
A 9 CM. TROCHOTRON FOR MASS ANALYSIS. G. W. Monk, G. N. Steele, and L. E. Burkhart. Oct. 7, 1947. Decl. Nov. 28, 1955. 10p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

2478   Y-32
Carbide and Carbon Chemicals Co. Y-12 Plant, Oak Ridge, Tenn.
CARBON ION SOURCE. N. Stetson and R. L. Murray. Oct 9, 1947. Decl. Nov. 28, 1955. 6p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

In an attempt to devise a source of C^+ ions to be used in the mass spectrograph which would give an increased output, a study was made of the properties of carbon arcs. It appeared that increasing the density of the electron beam used to maintain the arc and moving the arc as close as possible to the source aperture were beneficial. (B.J.H.)

MATHEMATICS

2479   Y-243
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
EFFECT OF INITIAL VELOCITY IN ELECTRON MOTION IN CROSSED FIELDS. A. J. Preslar and Raymond Murray. July 29, 1948. Decl. Dec. 8, 1955. 9p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

A derivation is given of the paths of electrons in the crossed electric and magnetic fields of the calutron, including the effect of initial velocity. Graphs to illustrate the motion are shown, and application to conditions in the

accelerating gap and between high voltage shields is made. (auth)

MEASURING INSTRUMENTS AND TECHNIQUES

2480 HW-11379
[Hanford Works, Richland, Wash.]
EXTRAPOLATION CHAMBER MEASUREMENTS OF THE BETA RAY SURFACE DOSE FROM URANIUM. H. E. Leap, Jr. and G. H. Whipple, Jr. Oct. 28, 1948. Decl. Dec. 2, 1955. 9p. Contract [W-31-109-Eng-52]. $1.80 (ph OTS); $1.80(mf OTS).

The design of the extrapolation chamber used is given and discussed. Results of the measurements are summarized. (B.J.H.)

2481 HW-13658
Hanford Works, Richland, Wash.
FAST NEUTRON SENSITIVITY OF THE CP METER. E. E. Baker, F. R. Gydesen, and G. H. Whipple, Jr. June 10, 1949. Decl. Dec. 3, 1955. 16p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf OTS),

The sensitivity to fast neutrons of a CP Meter ionization chamber of the type used for health physics beta and gamma survey measurements has been investigated. The result obtained gives the ratio of the current produced by 100 Po-Be $n/cm^2/sec$ to the current produced by 12.5 mr/hr of Ra gamma as 0.084 ± 0.007. (auth)

2482 HW-15204
[Hanford Works, Richland, Wash.]
EFFECT OF TEMPERATURE ON BETA-RAY MEASUREMENTS. A. J. Stevens. Nov. 23, 1949. Decl. Dec. 3, 1955. 26p. Contract [W-31-109-Eng-52]. $4.80(ph OTS); $2.70(mf OTS).

Photographic methods of measuring β radiation were investigated, and a study of temperature effects on these measurements is included. Experimental data are submitted to show that an increase in film temperature before and during β irradiation causes a definite increase in density for the same dosage. Recommendations drawn from experience gained in the experimental work are offered. (auth)

2483 IDO-16056
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
CALIBRATION OF MTR NEUTRON SOURCES. S. G. Forbes. Jan. 15, 1953. Decl. Dec. 6, 1955. 17p. $3.30 (ph OTS); $2.40(mf OTS).

Two one-half gram Ra-Be neutron sources were taken from the MTR to the Los Alamos Scientific Laboratory for calibration in their standard graphite pile. Los Alamos Ra-Be source #44 was used as the standard and all Q values are based on the absolute calibration of this source. The MTR sources were calibrated by means of both a BF_3 counter method and an In foil method. The results of the two methods agree well within the experimental error of one percent and yield source strengths of 5.96×10^6 and 5.70×10^6 neutrons per second for MTR #1 and #2 respectively. A description of the methods used and the experimental data obtained are given. (auth)

2484 K-286
Carbide and Carbon Chemicals Corp. [K-25 Plant], Oak Ridge, Tenn.
LINE FILTER FOR POPPY RADIATION DETECTION

METERS. N. H. Pease. Oct. 18, 1948. Decl. Dec. 5, 1955. 5p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Various electrical devices were sources of interference noise which entered the Poppies through the power lines and caused background counts to be registered. The investigation showed that most of the interference could be removed by the use of a Sola Constant Voltage transformer. A Cornell Dubilier Interference Filter IF-18 inserted between the Sola and the Poppy reduced the remaining interference. The Raytheon Poppy was the most sensitive to line interference of the models tested. The Model C, C&CCC, K-25 Poppy was the least sensitive. (auth)

2485 MLM-229
Mound Lab., Miamisburg, Ohio.
GEOMETRICAL PROPERTIES OF THE HANSON LONG TUBE NEUTRON COUNTER. T. I. Davenport and H. P. Knauss. Nov. 10, 1948. Decl. Dec. 7, 1955. 7p. Contract AT-33-1-GEN-53. $1.80(ph OTS); $1.80(mf OTS).

In order to compare powerful neutron sources with the Ra-Be standard, an attempt was made to extend the range of measurements by changing the geometry of a boron-lined proportional counter. The most successful results were obtained with a modification of the "long tube" neutron counter. (B.J.H.)

2486 N-812
[Chicago. Univ. Metallurgical Lab.]
TECHNIQUE FOR FILLING GEIGER COUNTERS AT CHICAGO. Harry Bryant and Mary Burke. Mar. 14, 1944. Decl. Nov. 29, 1955. 6p. Contract [W-7401-eng-37]. (MUC-WPJ-14) $1.80(ph OTS); $1.80(mf OTS).

2487 N-1367
[Chicago. Univ. Metallurgical Lab.]
INSTRUCTIONS FOR OPERATING PORTABLE G-M RADIATION METERS. George A. Binder. July 11, 1944. Decl. Nov. 29, 1955. 9p. Contract [W-7401-eng-37]. $1.80(ph OTS); $1.80(mf OTS).

2488 UCRL-111
California. Univ., Berkeley. Radiation Lab.
SUMMARY OF THE RESEARCH PROGRESS MEETING, MAY 13, 1948. R. K. Wakerling. Decl. Nov. 28, 1955. 5p. Contract W-7405-eng-48. $1.80(ph OTS); $1.80(mf OTS).

Brief discussions are given on meson mass determination by grain counting, a magnetic β-ray lens spectrograph, and anthracene counter development. (L.M.T.)

NEUTRONS

2489 BNL-1574
Brookhaven National Lab., Upton, N. Y.
THE ψ^{-3} APPROXIMATION WITH ANISOTROPIC EFFECTS FOR CYLINDRICAL GEOMETRY. J. Fleck. Jan. 22, 1953. Decl. Dec. 13, 1955. 11p. $3.30(ph OTS); $2.40(mf OTS).

The method of spherical harmonic tensors, developed for solving the Boltzmann transport equation in isotropic media, is herein extended to anisotropic media for cylindrical geometry. A formal solution is given for the case of two concentric cylindrical media, A and B, but no numerical work has yet been done. The external medium B is assumed to be both a neutron absorber and finite in extent rather than a non-absorber and infinite in extent. (auth)

2490   CNL-17

[Clinton National Lab., Oak Ridge, Tenn.]

DEVELOPMENT OF A PROCESS FOR PRODUCTION OF RADIUM−BERYLLIUM SOURCES. Final Report. O. Sisman. Jan. 28, 1948. Decl. Nov. 28, 1955. 62p. Contract W-7405-eng-26. $10.80(ph OTS); $3.90(mf OTS).

Development, design, and operation of a process for the production of Ra-Be neutron sources is discussed with emphasis on the mechanisms that are used for carrying out the process by remote control. Two separate installations are used; one for making small, unpelleted sources and the other for making large pelleted sources. Sources containing 25 mg or less of Ra are made by hand in a dry box with a yield of 70 to 100%. Larger sources, containing up to 5 gm of Ra, are made in a large cell which is shielded by 2 ft. of concrete. All operations in the cell are performed using remotely controlled equipment and are viewed through periscopes. Yields for the large sources are near 100%. (auth)

2491   LA-603

Los Alamos Scientific Lab., N. Mex.

NEUTRON DIFFUSION IN A SPACE LATTICE OF FISSIONABLE AND ABSORBING MATERIALS. T. A. Welton and R. P. Feynman. Aug. 27, 1946. Decl. Dec. 16, 1955. 21p. Contract [W-7405-eng-36]. $3.30(ph OTS); $2.40(mf OTS).

Methods are developed for estimating the effect on a critical assembly of fabricating it as a lattice rather than in the more simply interpreted homogeneous manner. An idealized case is discussed supposing an infinite medium in which fission, elastic scattering, and absorption can occur, neutrons of only one velocity present, and the neutron mean free path independent of position and equal to unity with the unit of length used. (auth)

2492   NAA-SR-24

North American Aviation, Inc., Los Angeles.

CALCULATIONS ON MIXTURES OF NEUTRON SHIELDING MATERIALS. M. A. Greenfield. Jan. 1, 1949. Decl. Dec. 6, 1955. 30p. $6.30(ph OTS); $3.00(mf OTS).

Figures of merit are computed for the neutron shielding efficiency, due only to scattering at constant energy, for $C_{22}H_{46}$ (docosane, a paraffin), $B_{10}H_{14}$ (decaborane), natural B and twenty-two other elements. These computations indicate that the first three substances mentioned have the greatest practical interest for the energy range 2 to 10 Mev. Calculations and curves are presented for the attenuation by absorption in B and $B_{10}H_{14}$; and for the variation of neutron density with ρZ (substance density x depth of penetration) for B, $B_{10}H_{14}$ and $C_{22}H_{46}$, for initial energy 2 Mev and final energies 10^4 ev and 1.4 ev. It is concluded that $B_{10}H_{14}$ is a promising neutron shield material. However, mixtures of several different substances, e.g., $B_{10}H_{14}$, B and $C_{22}H_{46}$,—will be required to shield effectively against the entire neutron energy spectrum. (auth)

2493   RL-28.5.146

[California. Univ., Berkeley. Radiation Lab.]

SUMMARY OF THE RESEARCH PROGRESS MEETING. R. K. Wakerling. Aug. 7, 1947. Decl. Nov. 28, 1955. 5p. Contract W-7405-eng-48. $1.80(ph OTS); $1.80(mf OTS).

A description is given of an experiment made in an attempt to discover a possible reaction other than the magnetic interaction between electrons and neutrons, assuming that 20% of the neutron lifetime is in the form of a proton plus a meson. The experiment was performed by allowing thermal neutrons to pass through a Xe-filled chamber and observing the scattering. Results seem to exclude any strong coupling, but results predicted by meson theory fall within the range of experimental errors. (B.J.H.)

NUCLEAR PHYSICS

2494   AECD-3791

Knolls Atomic Power Lab., Schenectady, N. Y.

REPORT OF THE NUCLEAR PHYSICS SECTION FOR SEPTEMBER, OCTOBER, NOVEMBER 1954. Decl. with deletions Dec. 5, 1955. 31p. Contract W-31-109-Eng-52. $6.30(ph OTS); $3.00(mf OTS).

A double-focusing spectrometer was used to search for low abundance isotopes of Ta, W, Nb, Ca, In, and Al. Ta^{180} with an abundance of 0.0123 ± 0.0003% was discovered. The half life of Ta^{180} was found to be $\geq 4 \times 10^9$ yrs. No new isotopes of the other elements were found, but new upper limits of their abundances have been set. The abundance of Pu^{241} has been measured to within 10% when the total amount of the isotope in the sample was of the order of 10^{-13} g. The possibility of developing thermoelectric power by means of the temperature gradient in fuel elements of nuclear reactors is being investigated. If high thermoelectric power is developed, it will have an important effect in reducing the large temperature rise in thick fuel plates to a metallurgically allowable limit. (M.P.G.)

2495   AECD-3792

Knolls Atomic Power Lab., Schenectady, N. Y.

REPORT OF THE NUCLEAR PHYSICS SECTION FOR MARCH, APRIL, MAY 1955. Decl. with deletions Dec. 5, 1955. 28p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

The neutron capture-to-fission ratio was measured for a "5000 ev" shielded U^{235} sample. The schematic diagram of a new three-stage mass spectrometer is given. An anticoincidence scintillation spectrometer which is being applied to the quantitative analysis of gross fission-product mixtures is described. Pu^{239} fission and absorption cross sections and temperature coefficients of reactivity are analyzed. The average of a Breit-Wigner resonance over a Maxwellian neutron spectrum is made. (B.J.H.)

2496   ANL-4397

Argonne National Lab., Lemont, Ill.

EXPERIMENTAL NUCLEAR PHYSICS DIVISION AND THEORETICAL NUCLEAR PHYSICS DIVISION QUARTERLY REPORT FOR OCTOBER, NOVEMBER AND DECEMBER 1949. Jan. 15, 1950. Decl. Dec. 13, 1955. 112p. Contract W-31-109-eng-38. $16.80(ph OTS); $5.70(mf OTS).

A neutron scattering resonance in Na^{23} at 3000 ev is discussed. A Breit-Wigner two-level fit to the total neutron cross section of Mn^{55} is given. Calculations are made on the negative scattering phase and the compound spin of the 2700-ev resonance in V^{51}. Neutron resonance scattering in light isotopes is also discussed. Data on the total neutron cross section of V^{51} are summarized. Equipment for the collimation of monoenergetic neutrons from the Van De Graaff generator is described. A study was made of coherent n-p scattering by liquid mirror reflection. The

neutron capture γ ray spectra of Br and Au are given. Further studies were made on the radiations of Hf^{181}, and a proposed decay scheme is given. The β spectrum and decay scheme of Tb^{160} were also investigated. Designs for a molecular beam apparatus are given. Results of charge transfer experiments with Br ions are reported. A decay scheme is proposed for Br^{87}. Fast chopper work is summarized. Theoretical considerations of the nuclear shell model based on j-j coupling are given. Consideration is also given to the influence of thermal motion and molecular distribution on the total reflection of neutrons. An interpretation is made of the lower energy states of Li^7 and Be^7. (B.J.H.)

2497   NAA-SR-286
North American Aviation, Inc., Downey, Calif.
RADIATION EFFECTS QUARTERLY PROGRESS REPORT [FOR] JULY—SEPTEMBER 1953. F. E. Faris, ed. Apr. 15, 1954. Decl. Dec. 7, 1955. 51p. Contract AT-11-1-GEN-8. $7.80(ph OTS); $3.30(mf OTS).

The effects of neutron irradiation on the thermal conductivity of various graphites are given in detailed graphs. The decrease in diamagnetism and corresponding increase in paramagnetism of graphite following neutron irradiation are also shown. The effect of annealing on the magnetic properties of irradiated graphite is given. The electrical properties of graphite irradiated with 10-Mev cyclotron protons are also given. The annealing characteristics of pile-irradiated graphite were studied. The time-temperature behavior of irradiated graphite samples is studied and data on the stored energy release and thermal annealing of irradiated graphite are given. Data are also given on the effects of impurities on the recovery of electrical resistivity in cold-worked Cu. The optical absorption of additively colored KCl was studied. Data are given on the radiation effects on the thermoelectric power of Fe. (B.J.H.)

2498   RL-28.5.109
[California. Univ., Berkeley. Radiation Lab.]
SUMMARY OF RESEARCH PROGRESS MEETING. R. [K.] Wakerling. May 31, 1946. Decl. Nov. 28, 1955. 12p. Contract W-740-eng-48. $3.30(ph OTS); $2.40(mf OTS).

The design of the rotating condenser for the 184-in. cyclotron is discussed. Tests were made with a $\frac{1}{8}$th scale a-c model of the synchrotron magnet. Work was continued on the fabrication of vacuum-tight pole pieces for the synchrotron. The energy distribution of uranium α particles is discussed. Experiments were made on a $\frac{1}{8}$th scale model of a tank of the linear accelerator. (B.J.H.)

2499   UCRL-96
California. Univ., Berkeley. Radiation Lab.
SUMMARY OF THE RESEARCH PROGRESS MEETING, APRIL 22, 1948. R. K. Wakerling. Decl. Nov. 28, 1955. 10p. Contract W-7405-eng-48. $1.80(ph OTS); $1.80 (mf OTS).

A description is given of experiments with 190-Mev deuterons which were conducted to check the validity of the theoretical range-energy formula. Results of measurements in Al are shown. Mass measurements of mesons were made from Hρ and range observations and by grain counting. Mesons of mass 190 and 300 e.m.u. were found. Attempts were also made to correlate experimental results of n-p scattering with theory. (B.J.H.)

2500   UCRL-132
California. Univ., Berkeley. Radiation Lab.
RESEARCH PROGRESS MEETING, JUNE 10, 1948. R. K. Wakerling. Decl. Nov. 28, 1955. 13p. Contract W-7405-eng-48. $3.30(ph OTS); $2.40(mf OTS).

A study was made of the arc source of the 184-in. cyclotron in order to determine the quantity of ions produced in the source. The slow neutron flux distribution in the cyclotron shielding is also given. A study was made of thorium fission by 37.5-Mev α particles. Values of the yields of the various fission products are plotted. (B.J.H.)

2501   UCRL-139
California. Univ., Berkeley. Radiation Lab.
SUMMARY OF THE RESEARCH PROGRESS MEETING, JUNE 17, 1948. Margaret Foss Folden. Decl. Nov. 28, 1955. 6p. Contract W-7405-eng-48. $1.80(ph OTS); $1.80(mf OTS).

Attempts to produce Ca^{41} by the reaction $A^{40}(\alpha,3n)Ca^{41}$ were not successful. However, the K yield from the reaction $A^{40}(\alpha,pn)K^{42}$ was good. K^{43}, from the reaction $A^{40}(\alpha,p)K^{43}$, was also present. Several cosmic-ray stars are also illustrated. (B.J.H.)

2502   UCRL-140
California. Univ., Berkeley. Radiation Lab.
SUMMARY OF THE RESEARCH PROGRESS MEETING, JUNE 24, 1948. R. K. Wakerling. Decl. with deletions Nov. 28, 1955. 9p. Contract W-7405-eng-48. $1.80(ph OTS); $1.80(mf OTS).

Spectrographic analyses of α-active materials are reviewed. The experimental theoretical work done on the range-energy determination for deuterons is discussed. (B.J.H.)

2503   UCRL-1280
California. Univ., Berkeley. Radiation Lab.
PROTON BEAM CURRENT MEASUREMENT IN THE LOW K.E.V. RANGE (Thesis). Forrest Fairbrother, Jr. June 5, 1951. Decl. Dec. 6, 1955. 52p. Contract Dec. 6, 1955. $9.30(ph OTS); $3.60(mf OTS).

Secondary charge effects from a 10 kilovolt proton beam and their effect upon beam current measurement are investigated. A collector is designed for beam current metering of a 60 kilovolt proton beam by means of charge measurement and energy measurement. (auth)

Refer also to abstract 2547.

NUCLEAR PROPERTIES

2504   LA-28
Los Alamos Scientific Lab., N. Mex.
MEASUREMENTS ON $\sigma_f(Pu^{239})/\sigma_f(U^{235})$ AND THE VALUE OF $\sigma_f(Pu^{239})$ AS A FUNCTION OF NEUTRON ENERGY. R. F. Taschek and J. H. Williams. Oct. 4, 1943. Decl. Dec. 12, 1955. 10p. $1.80(ph OTS); $1.80(mf OTS).

The relative fission cross section of Pu^{239} to U^{235} has been determined as a function of neutron energy in the range 0.08 to 1.5 Mev. The results show a marked dependence of neutron energy. The values of $\sigma(49)$ are plotted as a function of neutron energy on the basis of the measured value of $\sigma_f(49)/\sigma_f(25)$ for thermal neutrons and the Wisconsin measurements of $\sigma(25)$. (auth)

2505   LA-76
Los Alamos Scientific Lab., N. Mex.
DELAYED NEUTRONS FROM 49 (Pu^{239}). Robert R. Wilson

and Roger B. Sutton. May 8, 1944. Decl. Dec. 10, 1955.
5p. [Contract W-7405-eng-36.] $1.80(ph OTS); $1.80(mf
OTS).

The number of delayed neutrons from Pu^{239} relative to
the number from U^{235} has been measured by means of a
BF_3 ionization chamber. It is found that the neutrons
from Pu^{239} are distributed in time just as those from U^{235}
but are about 46% as numerous per fission. (auth)

2506   LA-91
Los Alamos Scientific Lab., N. Mex.
MEASUREMENTS ON THE CROSS-SECTION OF 49 [Pu^{239}]
AS A FUNCTION OF NEUTRON ENERGY IN THE RANGE
FROM 0.01 EV TO 3.0 EV. E. E. Anderson, L. S.
Lavatelli, B. D. McDaniel, and R. B. Sutton. June 23,
1944. Decl. Dec. 14, 1955. 36p. $6.30(ph OTS); $3.00
(mf OTS).

The transmission of Pu^{239} as a function of neutron
energy has been measured for the neutron energy range
0.01 ev to 3.0 ev. The measurement was accomplished by
the use of the slow-neutron velocity spectrometer. If
$\sigma_a(49)$ is defined as the total absorption cross-section of
Pu^{239} and v is the neutron velocity, the value of $\sigma_a(49)v$ is
constant from 0.01 ev up to about 0.03 ev and has the same
value and is also constant from about 1.0 ev up to about
3.0 ev, which is as far as the measurements were carried.
Between 0.03 ev and 1.0 ev a strong resonance appears
with the peak at 0.30 ev. The measured value of $\sigma_a(49)$ at
the peak of the resonance is 4400 barns which is only a
lower limit; the value of the width at half maximum is 0.11
ev which is only an upper limit. The value of $\sigma_a(49)$ at
0.0250 ev is 1057 barns. (This is corrected for scattering
of the oxygen in the sample and for the scattering of Pu^{239}.
A value of 10 barns was assumed for the scattering cross-
section of Pu^{239}.) A further experiment, utilizing a method
of cadmium differences, indicates that the 0.3 ev resonance
is in part a fission resonance. (auth)

NUCLEAR REACTORS

2507   A-4257
[General Electric Co., Schenectady, N. Y.].
METHODS OF CALCULATION SUITABLE FOR DILUTE
FAST AND FAST INTERMEDIATE PILES. PART I.
GENERAL THEORY FOR NO SLOWING DOWN IN RE-
FLECTOR AND ONE-VELOCITY APPROXIMATION.
Harvey Brooks. Nov. 6, 1946. Decl. Dec. 8, 1955.
21p. (GE-HB-7). $4.80(ph OTS); $2.70(mf OTS).

2508   AECD-3924
Oak Ridge National Lab., Tenn.
GAMMA RAY MEASUREMENTS AT THE BSF, EXPERI-
MENT II, IRON—WATER. L. H. Ballweg. May 3, 1951.
Decl. with deletions Dec. 15, 1955. 3p. [Contract W-7405-
eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Centerline measurements were made of the γ radiation
from the Bulk Shielding Reactor in an $Fe-H_2O$ mixture.
(B.J.H.)

2509   ANL-4483
Argonne National Lab., Lemont, Ill.
MATERIALS TESTING REACTOR PROJECT QUARTERLY
REPORT FOR PERIOD ENDING JUNE 1, 1950. J. R. Huff-
man. Decl. Dec. 13, 1955. 31p. Contract W-31-109-eng-
38. $6.30(ph OTS); $3.00(mf OTS).

Progress is reported on MTR site construction. An

analysis is made of the radiation dosage at the surface of
the canal water. The decay of process H_2O activity is also
given. (B.J.H.)

2510   ANL-4512
Argonne National Lab., Lemont, Ill.
NOTES ON THE ELECTROCHEMICAL CONVERSION OF
REACTOR ENERGY TO ELECTRICAL POWER. M. S.
Matheson, R. L. Seifert, and O. C. Simpson. Oct. 2, 1950.
Decl. Dec. 9, 1955. 9p. Contract W-31-109-eng-38.
$1.80(ph OTS); $1.80(mf OTS).

A discussion concerned with the possibility of using
aqueous systems to convert reactor energy to electro-
chemical energy is presented. It is based on presently
available information regarding the chemical changes that
may result from ionizing radiation in such systems. If
systems involving U, Pu, or Th produce similar changes,
the components of the reactor (or breeder) can possibly be
utilized to obtain electrochemical energy. This method of
extracting energy would necessarily involve the use of a
homogeneous reactor. In light of presently available data,
it does not seem probable that a large fraction of reactor
energy could be converted to electrical energy by an
electrochemical process. (M.P.G.)

2511   ANL-4596
Argonne National Lab., Lemont, Ill.
REACTOR ENGINEERING AND SERVICES DIVISION.
Quarterly Report [for] December 1, 1950 through Febru-
ary 28, 1951. W. P. Bigler. Mar. 14, 1951. Decl. Dec.
10, 1955. 29p. Contract W-31-109-eng-38. $4.80(ph
OTS); $2.70(mf OTS).

An electromagnetic pump, its head-capacity character-
istics when pumping NaK, and its current supply are
illustrated. The recommended building design for the
Argonne Research Reactor is discussed. Heat transfer and
fluid flow problems connected with D_2O flow and the effect
of the chilled water system on pile reactivity are discussed
in some detail, as is pile control by water expulsion.
Curves of heat production in U fuel rods after shutdown are
given, measurements of the resonance integral of massive
Th shapes are reported, and the status of an experiment
on change in length of U metal under irradiation is sum-
marized briefly. (M.P.G.)

2512   ANL-4951
Argonne National Lab., Lemont, Ill.
REACTOR ENGINEERING DIVISION QUARTERLY REPORT
[FOR] SEPTEMBER 1, 1952 THROUGH NOVEMBER 30,
1952. Dec. 15, 1952. Decl. Dec. 9, 1955. 24p. Contract
W-31-109-eng-38. $4.80(ph OTS); $2.70(mf OTS).

Particle-size studies are reported for two Al-jacketed
unirradiated U fuel slugs ruptured in a loop autoclave.
Four irradiated slugs were ruptured in an autoclave to
determine activity distribution and degree of cleanup of
the system. Results of He leak-detector tests on fuel
slugs are reported. Experiments to determine the effect
of oxide formation on fuel elements upon the system heat-
transfer coefficient are described. Theoretical treatment
is given of the decay of fission-product activity for cyclic
operation of a reactor. Theoretical treatment is also given
to the time-dependent heat conduction and temperature
distribution in fuel elements during reactor power excur-
sions and solutions are presented for spherical,
homogeneous-slab, and composite-slab heat sources.
(L.M.T.)

2513 BNL-20

Brookhaven National Lab., Upton, N. Y.
THE ESCAPE OF FISSION PRODUCTS FROM AN URANIUM ROD; APPLICATION TO THE B.N.L. REACTOR. J. Chernick and I. Kaplan. Nov. 3, 1948. Decl. Dec. 13, 1955. 25p. Contract [AT-30-2-gen-16]. $4.80(ph OTS); $2.70 (mf OTS).

Designs for a He leak detection system for cartridge failures in the Brookhaven Reactor are described. The system operates by filling the space between slugs and can with He. Should a leak develop, it is detected in its early stages by differential pressure gages. The kinetics of the escape of fission products from a slug are discussed. The diffusion of a primary radioactive fission product into the He and through the tubings are also calculated. These calculations are applied to the Brookhaven Reactor. (B.J.H.)

2514 BNL-22

Brookhaven National Lab., Upton, N. Y.
CALIBRATION OF CONTROL ROD SYSTEM OF THE X-10 REACTOR. Jules S. Levin and John W. Weil. Feb. 18, 1949. Decl. Dec. 13, 1955. 28p. $6.30(ph OTS); $3.00(mf OTS).

Experiments to determine the calibration of the ORNL Graphite Reactor regulating, shim, and safety rods are described. Data are given on the transient response of the power level caused by a small increment in control rod position, power sensitivity as a function of rod position, and reactivity as a function of rod position. (B.J.H.)

2515 BNL-1152

Brookhaven National Lab., Upton, N. Y.
INITIAL EXPERIMENTS ON THE BROOKHAVEN REACTOR. VI. FAST SOURCE CORRECTION FOR DIFFUSION LENGTH MEASUREMENTS ON BNL REACTOR. J. W. Weil. Aug. 18, 1949. Decl. Dec. 15, 1955. 6p. $1.80(ph OTS); $1.80(mf OTS).

Fast source corrections to the diffusion length data obtained for graphite in the Brookhaven Reactor were calculated for a Ra-Be source, using a value of 1.69 for the density of the graphite in the reactor. Corrections were measured for diffusion lengths measured parallel and perpendicular to the channels. (auth)

2516 BNL-1579

Brookhaven National Lab., Upton, N. Y.
ACCURACY OF RELAXATION LENGTH MEASUREMENTS. H. Kouts. Apr. 28, 1953. Decl. Dec. 13, 1955. 6p. Contract [AT-30-2-gen-16]. $1.80(ph OTS); $1.80(mf OTS).

The accuracy of relaxation lengths measured during H_2O-U lattice experiments is considered. The analysis was applied to a 2:1 H_2O-to-metal ratio, and results are tabulated. The analysis indicates that only geometrical factors cause departures from randomness in a least squares fit. (B.J.H.)

2517 BNL-1602

[Brookhaven National Lab., Upton, N. Y.]
HYDRODYNAMIC TEST OF CROSS FLOW REACTOR COMPONENT. T. V. Sheeman, R. T. Schomer, J. Weisman, and W. Regan. [1952?]. Decl. Dec. 2, 1955. 37p. $6.30(ph OTS); $3.00(mf OTS).

An attempt was made to determine the hydrodynamic effect of high velocity water flowing normal to a bank of long thin rods. Satisfactory instrumentation was developed

to detect rod vibration, but due to the failure of the rod end connections, only inconclusive data were obtained. However, the test did show that the vibrations were of an appreciable amplitude and would present a problem which must receive serious consideration in the design of any cross-flow reactor. (auth)

2518 BNL-1814

Brookhaven National Lab., Upton, N. Y.
LMFR PROGRESS LETTER FOR APRIL 1954. F. T. Miles. May 21, 1954. Decl. Dec. 12, 1955. 3p. [Contract AT-30-1-gen-16]. $1.80(ph OTS); $1.80(mf OTS).

Work which has been done on reactor transients, removal of Pa, Th and U distribution between salt and metal phases, and Pa^{233} distribution between Bi and Al is reported. The status of other work is discussed briefly, and the status of LMFR loops is summarized. (B.J.H.)

2519 BNL-2383

Brookhaven National Lab., Upton, N. Y.
NEUTRON ECONOMY AND CRITICAL SIZE CALCULATIONS. F. T. Miles. Jan. 16, 1953. Decl. Dec. 15, 1955. 5p. $1.80(ph OTS); $1.80(mf OTS).

A rough draft of calculations is presented for the Liquid Metal Fuel Reactor. Age theory is assumed for a bare, spherical, thermal core, homogeneous to neutrons, with resonance escape probability equal to unity. (M.P.G.)

2520 BNL-2384

Brookhaven National Lab., Upton, N. Y.
TEMPERATURE COEFFICIENT OF LMFR, CASE F. W. A. Robba. Jan. 14, 1954. Decl. Dec. 15, 1955. 9p. Contract [AT-30-2-gen-16]. $1.80(ph OTS); $1.80(mf OTS).

The temperature coefficient of the Liquid Metal Fuel Reactor with Be and graphite moderators has been calculated on the basis of the change in microscopic absorption cross sections with temperature, the change in density of the materials within the core, and the general expansion of the reactor core tank. The value of the "immediate" coefficient, which assumes an instantaneous temperature rise in the $U-Bi$ solution but that moderator and tank remain at the initial temperature was determined to be of the order of 3 to 5×10^{-5} per °C. The "final" coefficient takes account of an overall change in reactor parameters and was found to be of the order of 1.6 to 1.8×10^{-4} per °C. (M.P.G.)

2521 BNL-2392

Brookhaven National Lab., Upton, N. Y.
END LOSSES OF NEUTRONS IN DYNAMO VERSION OF THE LMFR. J. Chernick. Aug. 6, 1953. Decl. Dec. 19, 1955. 10p. $1.80(ph OTS); $1.80(mf OTS).

The Dynamo version of the externally cooled Liquid Metal Fuel Reactor consists of a small core surrounded by a sufficiently large blanket to reduce the neutron leakage through the sides of the reactor to an acceptable value. Several possible methods of reducing neutron losses through the ends of the reactor are presented and analyzed. A simple extension of core and blanket is found to be the least efficient scheme. The results of calculations indicate that there is no real gain in the use of graphite—Th end blankets and that a tapered duct carrying the $U-Bi$ solution provides a more efficient blanket. This conclusion is subject to the provision that the increased neutron energy spectrum in the blanket does not reduce the average value of η for U^{233} in this region. (M.P.G.)

2522   CE-1074
[Chicago. Univ.] Metallurgical Lab.
THERMAL SYPHON IN HOMOGENEOUS PILE. George F.
Quinn. Dec. 2, 1943. Decl. Dec. 13, 1955. 17p. (A-
1481). $3.30(ph OTS); $1.80(mf OTS).

It has been suggested that the use of a thermal syphon
may eliminate the mechanical difficulties introduced by
the use of pumps to circulate the slurry through the heat
exchangers of a homogeneous reactor. The motivating
force of such a system is provided by the density differ-
entials due to temperature changes. The system
considered consists of a horizontal heat exchanger directly
above the reactor. It is fed from the top of and delivers to
the bottom of the reaction tank. Results show that the use
of such a system is not practical, and other systems are
recommended (B.J.H.)

2523   CF-47-9-305
[Oak Ridge National Lab., Tenn.]
THERMAL COLUMN NEUTRON FLUX. L. C. Noderer and
R. R. Coveyou. Sept. 3, 1947. Decl. Dec. 16, 1955. 3p.
Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Relaxation methods are used to calculate the thermal
neutron flux distribution for a central plane of a reactor
thermal column. The flux distribution for the idealized
column used in the calculations is superimposed on a
drawing of a proposed thermal column. (B.J.H.)

2524   CF-49-1-193
[Oak Ridge National Lab., Tenn.]
BRIEF OF DEVELOPMENT REACTOR PROJECT. S.
McLain. Jan. 10, 1949. Decl. Dec. 19, 1955. 14p.
Contract [W-7405-eng-26]. $13.80(ph OTS); $4.80
(mf OTS).

The proposed design of the Materials Testing Reactor is
described in detail. (B.J.H.)

2525   CF-49-1-238
[Oak Ridge National Lab., Tenn.]
IS SHIELDING OF SUB-PILE ROOM FROM PILE WATER
ACTIVITY ADEQUATE? Nicholas M. Smith, Jr. Jan. 18,
1949. Decl. Dec. 19, 1955. 6p. Contract [W-7405-eng-
26]. $1.80(ph OTS); $1.80(mf OTS).

A study was made of Materials Testing Reactor Mockup
process water which becomes highly radioactive from
neutron bombardment in passing through the reactor. The
shield thickness in the sub-pile room was found to be in-
adequate if ordinary concrete is used. (B.J.H.)

2526   CF-49-4-123
[Oak Ridge National Lab., Tenn.]
DESIGN OF REGULATING ROD FOR HIGH FLUX REAC-
TOR. D. Nicoll. Mar. 14, 1949. Decl. Dec. 19, 1955.
45p. Contract [W-7405-eng-26]. $7.80(ph OTS);
$3.30(mf OTS).

The control elements for the high flux pile consist of a
number of shim and safety rods interlocked with a reg-
ulating rod. The regulating rod controls the fine ad-
justment of the pile and operates to positions that call for
the withdrawal or insertion of the shim and safety rods.
The shim and safety rods control the coarse adjustment
for the pile reactivity. The safety function depends on the
release of a magnetic coupling between the rod and drive
shaft for a quick drop of the rod. Four locations have
been provided in the Be reflector for the regulating rods.
Only one regulating rod is necessary for control of the

pile, but a standby will be available in case of emergency.
Two spare regulating rod positions provide for flexibility
in selecting the various figurations for pile lattice.
Control circuits responding to the pile fluctuation operate
a servo motor which is mechanically coupled to a pinion
and rack that raises or lowers the regulating rod in and
out of the pile. Under normal operating conditions,
motion of the rod is stopped by the amplidyne armature
circuit dynamically braking the motor. In case of failure
of electronic tubes, or under extreme operating conditions,
the rod is stopped by hydraulic shock absorbers at the
extremities of its stroke. A position indicating device is
included in the design to indicate remotely the exact
position of the rod at any time. A remote coupling device
in the regulating rod drive shaft permits coupling and
uncoupling of the rod and allows for removal of the top
plug. The upper part of the drive rod has been filled with
water to insure protection against γ radiation. (auth)

2527   CF-49-9-69
[Oak Ridge National Lab., Tenn.]
THERMAL STRESS IN CONCRETE SHIELD, MTR PROJ-
ECT. J. R. McWherter. Sept. 8, 1949. Decl. Dec. 21,
1955. 9p. Contract [W-7405-eng-26]. $1.80(ph OTS);
$1.80(mf OTS).

Assuming the upper portion of the concrete shield to
have the maximum Δ T across the concrete and the
quantity of heat passing through the full thickness to be
constant, the maximum allowable Δ T is tentatively set
as 50°F, which causes a compressive stress of 1600 p.s.i.
and a tensile stress of 460 p.s.i. in the concrete. By in-
creasing the maximum allowable Δ T, the stress is
correspondingly increased. (auth)

2528   CF-49-11-217
Oak Ridge National Lab., Tenn.
MATERIALS TESTING REACTOR DESIGN REPORT TANK
SECTIONS "A" AND "E." J. P. Gill. Nov. 22, 1949.
Contract [W-7405-eng-26]. Decl. Dec. 21, 1955. $3.30
(ph OTS); $2.40(mf OTS).

The design of the top and bottom sections of the reactor
tank is discussed. These sections are permanently fixed
in the reactor structure. Requirements and design data
are presented, including shielding requirements and
materials of construction. (M.P.G.)

2529   CF-49-11-226
Oak Ridge National Lab., Tenn.
CALIBRATION OF TD 271 FUEL ASSEMBLIES. T. H.
Mauney and W. L. Ross. Nov. 16, 1949. Decl. Dec. 15,
1955. 7p. Contract [W-7405-eng-26]. $1.80(ph OTS);
$1.80(mf OTS).

Velocity measurements were made as a function of
pressure drop across the length of fuel plates in a fuel
assembly. It is concluded that for a pressure drop of 18
psi across the plates, a minimum of 30 ft/sec will be
attained for cooling water velocity. (B.J.H.)

2530   CF-51-9-112
Oak Ridge National Lab., Tenn.
POWER CALCULATIONS OF THE UNIT SHIELD REACTOR.
E. B. Johnson. Sept. 18, 1951. Decl. Dec. 15, 1955. 15p.
Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Neutron flux measurements have been repeated in the
Bulk Shielding Facility, and the power distribution calcu-
lated. The results are tabulated and graphed. (M.P.G.)

2531 CF-51-12-1

Oak Ridge National Lab., Tenn.

DELAYED NEUTRONS AND THEIR REACTIVITY CONTRIBUTION TO THE HOMOGENEOUS REACTOR. R. E. Aven. Dec. 4, 1951. Decl. Dec. 16, 1955. 11p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Equations are derived for delayed neutron contribution to reactivity. Results of calculations are presented in tables and graphs. (M.P.G.)

2532 CF-52-3-134

Oak Ridge National Lab., Tenn.

GAMMA RAY DISTRIBUTION THROUGH WATER IN THE RESEARCH REACTOR AND BULK SHIELDING FACILITY. James A. Lane. Mar. 14, 1952. Decl. Dec. 6, 1955. 8p. $1.80(ph OTS); $1.80(mf OTS).

2533 CF-52-4-39

Oak Ridge National Lab., Tenn.

CALCULATIONS FOR THE COOLING WATER ACTIVITY OF THE RESEARCH REACTOR. Richard Stephenson. Apr. 8, 1952. Decl. Dec. 16, 1955. 8p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Calculations for the cooling water activity are given for cycle times of 300, 600, and 900 sec and for cooling times of 0, 100, 300, 600, and 900 sec after leaving the reactor. Results are presented in tables and graphs. (M.P.G.)

2534 CF-52-12-118

Oak Ridge National Lab., Tenn.

SOME CALCULATIONS FOR THE BOILING REACTOR SHIELD. R. E. Aven, A. R. Eckels, and P. N. Haubenreich. Dec. 18, 1952. Decl. Dec. 2, 1955. 24p. $4.80(ph OTS); $2.70(mf OTS).

The shield for the boiling reactor experiment is intended to serve for a series of homogeneous reactors. With this in mind the layout shown has been designed to provide flexibility. In order to obtain information on required shield thicknesses, some calculations have been made for the first two proposed reactors, the Teapot and a six-foot boiling reactor. Calculations include the radiation from the reactor compartment into the instrument room and through the top shield during operation. In the case of the six-foot reactor, the radiation in the instrument room from a sudden dump into the tanks beneath the floor has also been calculated. (auth)

2535 CF-53-4-48

Oak Ridge National Lab., Tenn.

THE ORR AS AN ENGINEERING TEST FACILITY. Alvin M. Weinberg. Apr. 8, 1953. Decl. Dec. 20, 1955. 7p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

A discussion of the Oak Ridge Research Reactor is presented to justify the need for such a reactor as a general research and test facility. The basic design principle is to provide ready accessibility to large volumes containing high neutron flux. The reactor is particularly needed for long-term engineering tests. (M.P.G.)

2536 DP-100

Du Pont de Nemours (E. I.) and Co. Savannah River Lab., Augusta, Ga.

A SAFETY ROD ACTUATOR. D. Baker, Jr., W. E. Llewellyn, and J. P. Maloney. Dec. 1954. Decl. Dec. 2, 1955. 27p. Contract AT(07-2)-1. $4.80(ph OTS); $2.70(mf OTS).

A windlass that operates a safety rod for a nuclear reactor was developed to decelerate the rod after it drops under emergency conditions in the reactor. The windlass is designed to convert the kinetic energy of the falling rod as it nears its limit of travel to rotational energy in the windlass. The conversion is accomplished without the aid of an external power source or an auxiliary snubbing mechanism. (auth)

2537 HW-13167

Hanford Works, Richland, Wash.

THE CRITICAL MASS OF A SPHERICAL REACTOR WITH VARIABLE INTRINSIC BUCKLING. G. M. Muller. Apr. 28, 1949. Decl. Dec. 2, 1955. 14p. Contract [W-31-109-eng-52]. $3.30(ph OTS); $2.40 (mf OTS).

The critical mass both of an untamped and water-tamped sphere with parabolic radial variation of the intrinsic buckling is calculated by a perturbation method. The result is applied to finding the minimum critical mass of Pu in water suspension with infinite water tamper; the calculations show that the minimum critical mass at constant concentration may be reduced by an amount of the order of 7.6% when the concentration of Pu is permitted to vary throughout the suspension. (auth)

2538 HW-19563

Hanford Works, Richland, Wash.

CONSTRUCTION TEST; HIGH DENSITY CONCRETE SHIELDING. L. L. Rice. Nov. 24, 1950. Decl. Dec. 5, 1955. 31p. Contract W-31-109-Eng-52. $6.30(ph OTS); $3.00(mf OTS)

In order to evaluate and improve methods for the design and construction of high density concrete shielding, a section of shielding, approximately four feet in each overall dimension, was constructed. The section consisted of four steel crates, each containing nine tubes, which were welded together and filled with heavy-aggregate concrete. The procedures and equipment used and the results obtained are discussed in detail. The crate fabrication and erection procedures gave reasonably good results, though considerable difficulty was encountered in mixing and discharging the concrete. (B.J.H.)

2539 HW-20722

Hanford Works, Richland, Wash.

THE PREPARATION OF SAMPLES FOR HANFORD WORKS SPECIAL IRRADIATION REQUESTS. J. V. McMaster and H. A. Johnson. Apr. 9, 1951. Decl. Dec. 7, 1955. 22p. Contract W-31-109-eng-52. $4.80(ph OTS); $2.70(mf OTS).

With the extension of bubble-test inspection regulations to cover Special Irradiation Request test hole samples, it became necessary to develop a practical method of sealing aluminum sample casings with leak-proof closures. This investigation was further warranted by the advantages to be gained from the development of standard designs and methods of sealing which could be used with receptacle sample casings as well as with test hole casings. By using a specially designed tool and with re-designed casing components, a method was devised for making air-tight, crimped closures at the juncture of the aluminum sample tube with the aluminum end plugs. The closures, when properly made, passed the standard bubble-test inspection. In addition, attempts to weld the end plugs in the tube proved that welding also was a satisfactory and practical sealing medium. (auth)

2540   LAMS-727
Los Alamos Scientific Lab., N. Mex.
THE NEUTRON ENERGY DISTRIBUTION IN THE CENTER
OF THE LOS ALAMOS PLUTONIUM REACTOR. Jane H.
Hall. May 12, 1948. Decl. Dec. 9, 1955. 19p. Contract
[W-7405-eng-36]. $3.30(ph OTS); $2.40(mf OTS).

The neutron energy distribution in the center of the Los
Alamos Plutonium Reactor was examined by the use of
fission photographic plates, by a fission counter, and by
activation of S and Al detectors using the (n,p) threshold
reactions. Experimental arrangements and procedures
are discussed in detail, and results are tabulated. (B.J.H.)

2541   M-4128
[Clinton Labs., Oak Ridge, Tenn.]
PILE TECHNOLOGY LECTURE 46. HEAT TRANSFER
MECHANISMS FOR ENERGY REMOVAL FROM PILES.
R. M. Boarts. [194?]. Decl. Dec. 6, 1955. 30p. (CF-47-
9-370). $6.30(ph OTS); $3.00(mf OTS).

Suggested methods of energy removal from reactors are
summarized. These include removal by sensible flow, by
the latent heat from a change of state, by the latent heat of
other physical changes, by heat from chemical changes, or
by direct electrical take-off. Basic principles of heat
transfer mechanisms, including radiation, conduction,
convection, and boiling, are reviewed. (B.J.H.)

2542   M-4430
Massachusetts Inst. of Tech., Cambridge. Servomecha-
    nisms Lab.
AUTOMATIC POWER REGULATION FOR THE BROOK-
HAVEN REACTOR. F. A. Hadden. Feb. 3, 1949. Decl.
Dec. 6, 1955. 61p. $10.80(ph OTS); $3.90(mf OTS).

The problem of the power regulation of the Brookhaven
reactor was investigated. The basic considerations,
including the determination of the characteristics of the
components, the analysis and synthesis of the automatic
control system, and the design of components, are
described. Sections on calibration, testing, and operational
characteristics are included. (auth)

2543   MonP-360
Clinton Labs., Oak Ridge, Tenn.
NUMERICAL INTEGRATION OF MULTI-GROUP PILE
EQUATIONS. A. V. H. Masket. Oct. 8, 1947. Decl.
Dec. 7, 1955. 16p. Contract W-35-058-eng-71. $3.30
(ph OTS); $2.40(mf OTS).

A simple integration and iteration technique is applied
to the solution of the coupled differential equations which
arise from the multi-group picture in a finite pile which
is symmetric with respect to a plane, line, or point. These
symmetry conditions mean that the equations can be
integrated with respect to one independent spatial
coordinate. This numerical integration cannot be applied,
however, to a symmetric pile which is infinite in the
independent spatial coordinate. An alternate procedure
is described for this case. (B.J.H.)

2544   NAA-SR-275
North American Aviation, Inc., Downey, Calif.
REACTOR PHYSICS QUARTERLY PROGRESS REPORT
[FOR] MAY-JULY 1953. R. A. Laubenstein, ed. Mar.
1, 1954. Decl. Dec. 5, 1955. 22p. Contract AT-11-1-
GEN-8. $3.30(ph OTS); $2.40(mf OTS).

The exponential project facilities were used during the
quarter for experimental measurements relating to the flux
distributions to be expected in a proposed uranium

converter reactor. Theoretical analysis of data obtained on
the exponential experiments with uranium-heavy water
lattices has continued. Cadmium ratio data for 32 uranium-
D_2O lattices have been compiled and agreement found with
theoretical calculations. Calculations have been made for
the reflection of neutrons from concrete shielding around
the exponential assembly. Measurements with the danger
coefficient facility have been simplified by the photographic
recording of data. Preliminary work indicates that danger
coefficient measurements can be made with an apparent un-
certainty of less than 10^{-3} cm^2. Analysis of the atmosphere
in the Water Boiler Neutron Source gas handling system
indicates that the only detectable radioactive isotopes are
the xenon and krypton, together with their daughter products.
No iodine activity was found. A Nordsieck computer has
been received and placed in operation. This machine is a
mechanical type of differential analyzer. A problem on the
long term irradiation of nuclear fuels has been developed in
a form convenient for calculation on an IBM card
programmed computer and calculations are now in progress.
(auth)

2545   ORNL-26
Oak Ridge National Lab., Tenn.
THE POOR MAN'S PILE-FIRST APPROXIMATION. M. C.
Leverett. Apr. 1, 1948. Decl. Dec. 7, 1955. 21p. Con-
tract [W-7405-eng-26]. $9.30(ph OTS); $3.60(mf OTS).

A brief study shows that a modification of the high flux
pile, designed to operate at 3000 kw and suitable for
experimental use in a large university or other research
institution, can be built for about $2,500,000, contractor's
overhead not included. Of this, the pile and its associated
operating equipment is about one-forth. The main in-
novations, aside from reducing the power and thus
eliminating much of the process water equipment, are the
substitution of graphite pebbles for the beryllium re-
flector of the high flux pile, the elimination of a water
head tank, and the simplification of the experimental
facilities. Operation of the facility, experimenters'
salaries not included, would cost about one-quarter
million dollars per year if run continuously. The initial
charge of U^{235} should last $\frac{1}{2}$ to 2 years, and would be
returned to the Atomic Energy Commission for chemical
treatment. (auth)

2546   ORNL-550
Oak Ridge National Lab., Tenn.
HEAT TRANSFER AND WATER FLOW IN ACTIVE SEC-
TIONS WITH VARIOUS PLATE SPACINGS. R. Van
Winkle. Feb. 28, 1949. Decl. Dec. 8, 1955. 28p. Con-
tract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

Preliminary calculations are presented on heat transfer
and water flow in active sections of the Materials Testing
Reactor Mockup. (C.H.)

Refer also to abstracts 2328, 2558, 2561, 2562, and 2563.

PARTICLE ACCELERATORS

2547   RL-28.5.114
[California. Univ., Berkeley. Radiation Lab.]
SUMMARY OF THE RESEARCH PROGRESS MEETING.
R. K. Wakerling. July 11, 1946. Decl. Nov. 28, 1955.
5p. Contract W-7405-eng-48. $1.80(ph OTS); $1.80
(mf OTS).

Reports of tests made in the short vacuum section of the linear accelerator are presented. Tests on a-c and d-c models of the synchrotron magnet were discussed. (B.J.H.)

RADIATION ABSORPTION AND SCATTERING

2548   AECD-3842
Chicago. Univ. Metallurgical Lab.
THE MOTION OF MASSIVE PARTICLES THROUGH SOLID MATTER. Frederick Seitz. April 27, 1944. Decl. with deletions Dec. 12, 1955. 31p. $6.30(ph OTS); $3.00(mf OTS).

The ranges of knocked-on atoms and the number of displaced atoms per primary neutron are computed for aluminum and graphite on the basis of a somewhat simplified model. It is found that excitation and elastic collisions are the processes that dissipate practically all of the energy of the knocked-on atoms. The dissipation is about equally divided for the entire range of energy in the case of Al. Excitation is the overwhelming process in graphite when the energy of the atoms is about 41 kev whereas, elastic collisions are the more important at lower energies. It is found that the range of a 300 kev C atom is about 4.9×10^{-5} cm, whereas the range of a 300 kev Al atom is 2.8×10^{-5} cm. It is found that about 25% of the C atoms in the graphite near the slugs are displaced in the time required to convert 10% of the 25. In making this estimate it is assumed that the atoms must receive at least 25 ev to be permanently displaced. The same line of reasoning leads to the conclusion that about 23% of the Al atoms in the water tubes are displaced in the same time. The influence of back diffusion of displaced atoms is not taken into account in these calculations and probably plays an important role in the case of the Al. Extension of the work to U shows that the fission fragments should cause each U atom to be displaced about 112 times during the time in which 10% of the 25 has reacted. (auth)

2549   CF-48-8-328
[Oak Ridge National Lab., Tenn.]
REFLECTION FROM THE GROUND (Exp. 111. ARUU Program). T. E. Bortner. Aug. 22, 1948. Decl. Nov. 29, 1955. 3p. $1.80(ph OTS); $1.80(mf OTS).

Scattered γ radiation from a Ta source reading 2988 mr/hr at one meter was observed. Clay, plywood, graphite, cement, Al, steel, and Pb were used as the scattering materials, and readings of the scattered radiation were taken at various heights with source-detector distances of 100 and 200 cm. All data are summarized. (B.J.H.)

2550   LA-243
Los Alamos Scientific Lab., N. Mex.
SCATTERING PROPERTIES OF BORON. H. Barschall, M. Battat, and W. C. Bright. Mar. 16, 1945. Decl. Dec. 16, 1955. 13p. Contract [W-7405-eng-36]. $3.30(ph OTS); $2.40(mf OTS).

The total cross section of boron was measured for neutrons of energies between 200 and 3000 kev. For this experiment a sample of normal boron and one containing 53% B^{10} were used in an attempt to distinguish between the properties of the two isotopes. In addition poor-geometry and back-scattering experiments were carried out at 600 kev and 1500 kev using a normal sample and one containing 80.5% B^{10}. (auth)

2551   UCRL-114
California. Univ., Berkeley. Radiation Lab.
RESEARCH PROGRESS MEETING, MAY 17, 1948. R. K. Wakerling. Decl. Nov. 28, 1955. 6p. Contract W-7405-eng-48. $1.80(ph OTS); $1.80(mf OTS).

Development work concerning the scattering of 90-Mev neutrons with proportional counters in coincidence as detectors and the measuring of total cross sections with Bi fission counters is summarized. (L.M.T.)

Refer also to abstracts 2508, 2560, and 2569.

RADIATION EFFECTS

2552   BNL-1365
Brookhaven National Lab. Upton, N. Y.
IRRADIATION EFFECTS ON 2S ALUMINUM. H. C. Cook. Apr. 5, 1951. Decl. Dec. 12, 1955. 6p. $1.80(ph OTS); $1.80(mf OTS).

Experiments are described in which a 2S Al sample was irradiated with neutrons. Within the limits of the sensitivity of the measuring equipment, no change in length was observed in the Al. (B.J.H.)

2553   CF-52-5-211
Oak Ridge National Lab., Tenn.
THE EFFECT OF GAMMA RADIATION UPON LEAD SULFIDE COATED GLASS FIRE DETECTION CELLS ("FIREYE"). QUARTERLY REPORT FOR PERIOD FEBRUARY 10, 1952–MAY 10, 1952. D. F. Pickard. May 28, 1952. Decl. Nov. 28, 1955. 23p. $4.80(ph OTS); $2.70(mf OTS).

Lead sulfide-coated glass "Fireye" fire detection cells were exposed to radiation in order to determine the maximum dosage which the cells could receive while functioning dependably. The data show that γ radiation greatly reduces the sensitivity of the cells and that the detection system is not dependable when exposed to γ radiation exceeding a total dosage of 10^8 r. (B.J.H.)

2554   NAA-SR-168
North American Aviation, Inc., Downey, Calif.
THE EFFECT OF IRRADIATION ON DIFFUSION IN COPPER-GOLD AND COPPER-NICKEL POWDER COMPACTS. Pol Duwez and R. D. Johnson. Mar. 7, 1952. Decl. Dec. 7, 1955. 31p. Contract AT-11-1-Gen-8. $4.80(ph OTS); $2.70(mf OTS).

Techniques are described for performing intermetallic diffusion experiments in the presence of both cyclotron and reactor irradiations. Diffusion specimens are in the form of powder compacts of definite particle size. The progress of diffusion is determined by x-ray-diffraction measurements of the lattice parameter of one phase of the solid solution. Results are presented for experiments in the gold–copper and copper–nickel systems irradiated on the 60-inch Univ. of California cyclotron and in a Hanford hot test hole. No significant effect of irradiation on the rate of intermetallic diffusion has been detected in the two systems studied, although both systems diffuse by substitutional methods. An interpretation of the results is presented on the basis of theory previously reported for intermetallic diffusion in powder compacts. (auth)

2555   NAA-SR-248
North American Aviation, Inc., Downey, Calif.
ELECTRONIC PROPERTIES OF A GRAPHITIZED LAMP-BLACK AND THEIR DEPENDENCE ON NEUTRON IRRADI-

ATION. A. W. Smith and J. D. McClelland. June 1, 1953. Decl. Dec. 6, 1955. 26p. Contract AT-11-1-GEN-8. $4.80(ph OTS); $2.70(mf OTS).

The magnetic susceptibility, Hall coefficient, magneto-resistivity, thermoelectric power, and electrical resistivity have been measured for type SA-25 graphitized lampblack, samples of which have received neutron irradiations up to 460 Mwd/ct. Type SA-25 graphite has extremely small sized particles in contrast to other graphite types such as AGOT or AWG. The results presented here show that magnetic susceptibility is nearly insensitive to changes in particle size. Electrical resistivity and magneto-resistivity, on the other hand, are much greater for the small particle graphite. This can be explained by the greater scattering of electrons in the small particle type SA-25 graphite. The differences between the Hall coefficient and thermoelectric power of the small and large particle graphites are more complex and cannot be explained by theories published to date which assume an energy independent mean free path. Recent theoretical work in this laboratory, however, indicates that a more precise theory including the actual energy dependence of the scattering can explain these differences. (auth)

Refer also to abstracts 2316, 2317, 2318, 2320, 2445, and 2497.

RADIOACTIVITY

2556   ANL-4926
Argonne National Lab., Lemont, Ill.
THE HALF-LIFE OF Pu^{241}. Joseph Mech and Gray Pyle. Dec. 1953. Decl. Dec. 9, 1955. 9p. Contract W-31-109-eng-38. $1.80(ph OTS); $1.80(mf OTS).

The β half life of Pu^{241} was obtained by measuring the increase in the number of α particles due to Am^{241} formed by the β decay of Pu^{241} in samples of Pu of known isotopic constitutions. The value determined from measurements on 3 samples was 12.8 ± 0.3 years. (M.P.G.)

SHIELDING

2557   AECD-3841
Brookhaven National Lab., Upton, N. Y.
NEUTRON STREAMING IN STEEL: THE DEPENDENCE OF THE STREAMING ON THE NICKEL CONTENT OF THE STEEL. Robert D. Schamberger and Ferdinand J. Shore. May 25, 1953. Decl. with deletions Dec. 12, 1955. 23p. $4.80(ph OTS); $2.70(mf OTS).

Thermal neutron flux was measured above slabs of 347 stainless steel and "armor plate" which has a Ni content of 1.91%. Data from horizontal and vertical traverses made with various stack configurations are presented in graphical form. A significant difference was observed in the streaming properties of long paths of "armor plate" and stainless steel. (M.P.G.)

2558   CF-50-1-45
Oak Ridge National Lab., Tenn.
TEMPERATURES IN THE BOTTOM THERMAL SHIELD PROPOSED FOR THE MATERIALS TESTING REACTOR. R. B. Briggs. Jan. 10, 1950. Decl. Dec. 15, 1955. 28p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

Calculations and discussion are presented for estimating these temperatures with the reactor operating at normal power with a 3.5 kg loading. The estimated temperatures were to be used in estimating stresses and in the preparation of a final design. (L.M.T.)

2559   CF-50-1-157
Oak Ridge National Lab., Tenn.
NEUTRON STREAMING THROUGH PEBBLE DISCHARGE CHUTE. J. A. Lane. Jan. 30, 1950. Decl. Dec. 16, 1955. 4p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Calculations are presented showing the maximum thermal neutron flux streaming through the chute when it is empty and when it is filled with graphite balls during operation of the Materials Testing Reactor at 30 Mev. The chute consists of an 8 in. ID pipe with two 70° bends which goes from the graphite pebble zone through the shield and a pebble bin to the carrier cubicle. (M.P.G.)

2560   CF-50-8-85(Rev.)
Oak Ridge National Lab., Tenn.
GAMMA ATTENUATION MEASUREMENTS THROUGH WATER IN THE MTR MOCK-UP. C. E. Clifford and T. H. Mauney. Nov. 3, 1950. Decl. Dec. 19, 1955. 10p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

In order to aid in determining the shielding required for the top plug of the MTR, measurements were made of the γ attenuation of the water above the lattice in the MTR mock-up. Vertical measurements were made through approximately 11' of water starting at 4' above the horizontal centerline of the reactor, and 3 horizontal traverses were made at various depths. Low intensity would not permit measurement of the attenuation of the full depth of water in the mock-up. However, since the attenuation was exponential over a factor of a 1000, it was felt that an extrapolation of an additional factor of a 100 could be made with reasonable certainty. This extrapolated value indicates that a γ flux of approximately 200 (± 100) mr per hour would be transmitted by the water for 30 megawatt power. (auth)

2561   CF-52-4-157
Oak Ridge National Lab., Tenn.
SHIELDING REQUIREMENTS AND HEAT GENERATION IN THE RESEARCH REACTOR. R. Stephenson and T. L. Trent. Apr. 28, 1952. Decl. Dec. 15, 1955. 7p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The γ attenuation and heat generation in the structural and shielding materials of the research reactor were calculated for each component of the γ-ray spectrum using the simple exponential absorption law. The total γ intensity at any point was then corrected for build-up and geometry. Results are presented in tables and graphs. (M.P.G.)

THEORETICAL.PHYSICS

2562   BNL-1577
Brookhaven National Lab., Upton, N. Y.
CALCULATION OF AVERAGE FLUX IN MODERATOR OF WATER LATTICES BY MEANS OF A RELAXATION METHOD. S. Oleksa and B. Mozer. Mar. 24, 1953. Decl. Dec. 14, 1955. 17p. $3.30(ph OTS); $2.40(mf OTS).

2563   C-88
[Chicago. Univ. Metallurgical Lab.]
THEORY OF CHARACTERISTIC MULTIPLICATION EQUA-

TION WITH APPLICATION TO BOUNDARY CONDITIONS AT INTERFACE BETWEEN TWO MULTIPLYING MEDIA. H. W. Ibser and John A. Wheeler. [nd]. Decl. Dec. 13, 1955. 25p. $4.80(ph OTS); $2.70(mf OTS).

A simplified discussion of the theory of the exponential experiment is presented, with a derivation of the relation connecting the multiplication factor, k, with the gradient of the neutron density, n. For a given value of k this equation permits an infinite number of characteristic values of $\Delta n/n$, a fact whose physical significance is brought out. A distinction is made between the transient solutions and the usual "enduring solution" of the characteristic equation. The properties of these characteristic solutions are used to discuss the boundary conditions at the interface between two multiplying media. The deviations from the treatment of the seed problem by Fermi and Breit are found to be small. (auth)

2564 CF-48-9-128
Oak Ridge National Lab., Tenn.
PILE NEUTRON PHYSICS. (Lecture Notes). CHAPTER VIa(cont.). SLOWING DOWN OF NEUTRONS. A. M. Weinberg. [Sept. 1948]. Decl. Dec. 20, 1955. 28p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

Included are notes on the space-independent Boltzmann equation and the neutron energy distribution, the spatial distribution of slowed neutrons, neutron age theory, the group method analysis, and the energy transfer distribution of slowed neutrons. (B.J.H.)

URANIUM AND URANIUM COMPOUNDS

2565 A-40
Princeton Univ., N. J.
ABSORPTION OF THERMAL NEUTRONS IN URANIUM. E. C. Creutz, R. R. Wilson, and E. P. Wigner. Sept. 26, 1941. Decl. Dec. 8, 1955. 41p. $7.80(ph OTS); $3.30 (mf OTS).

The absorption of thermal neutrons in uranium and uranium oxide has been studied. Neutrons from the cyclotron were slowed down by passage through a graphite block. A uranium or uranium oxide sphere was placed at various positions in the block. The neutron intensity at different points in the sphere and in the graphite was measured by observing the activity induced in detectors of uranium oxide or manganese. It was found that both the fission activity in the uranium oxide and the activity induced in manganese was affected by non-thermal neutrons. An experimental correction for such effects was made by making measurements with the detectors surrounded by cadmium. After such corrections, the results from three methods of procedure with the uranium oxide detectors and from the manganese detectors were consistent to within a few per cent. If f, the density of thermal neutrons in the absorbing material, is given by $\Delta f = \mathcal{K}^2 f$, the experimental data are shown to give a value $\mathcal{K} = 0.41$ cm^{-1} for a U metal sphere of density 8.6 in contrast to 0.35 cm^{-1} from constants given by Fermi and his collaborators. For a U_3O_8 sphere of density 5.3 the data give $\mathcal{K} = 0.24$ cm^{-1} in agreement with Fermi's results. Possible sources of error have been discussed. (auth)

2566 A-3947
National Bureau of Standards, Washington, D. C.
SPECIFIC HEAT, ENTHALPY, AND ENTROPY OF URA-NIUM FROM 0° TO 900°C. D. C. Ginnings and R. J. Corruccini. [1946?]. Decl. Dec. 7, 1955. 6p. $1.80(ph OTS); $1.80(mf OTS).

2567 ANL-5322
Argonne National Lab., Lemont, Ill.
A STUDY OF THE THERMAL NEUTRON FISSIONABILITY OF U^{239} AND Th^{233}. G. L. Pyle, P. R. Fields, and W. C. Bentley. Sept. 1954. Decl. Dec. 9, 1955. 7p. Contract W-31-109-eng-38. $1.80(ph OTS); $1.80(mf OTS).

The fission of U^{239} and Th^{233} by thermal neutrons was studied by irradiating samples of U^{238} and Th^{232}, electroplated on highly polished graphite, in the MTR. The samples were then quickly inserted into the thermal column, where the thermal neutron fission rates were followed for several hours. Owing to deviations in the statistics of the experiment, only upper limits for both isotopes were considered meaningful. The upper limit of fissionability for both isotopes was found to be 20 b. (K.S.)

2568 LA-55
[Los Alamos Scientific Lab., N. Mex.]
URANIUM ALLOY DEVELOPMENT. PART III. A. U. Seybolt, E. R. Jette, L. B. Stark, and W. Arnold. Jan. 14, 1944. Decl. Dec. 8, 1955. 21p. Contract [W-7405-eng-36]. $4.80(ph OTS); $2.70(mf OTS).

The heat treatment of extruded U rod containing about 0.1% C as major impurity was continued, and the maximum hardness obtained to date results from prolonged heating at 900°C and quenching in water. A summary of a suitable method for soft soldering and Ag—soldering U is given. Some compression stress-strain curves are given for U biscuit metal. A suitable melting and casting procedure for avoiding gravity segregation in Mo—U alloys has been developed. (auth)

2569 LA-81
[Los Alamos Scientific Lab., N. Mex.]
INELASTIC SCATTERING IN URANIUM. J. H. Manley. May 16, 1944. Decl. Dec. 14, 1955. 12p. $3.30(ph OTS); $2.40(mf OTS).

The distribution curves in paraffin for neutrons from Ra-Be and Ra-B sources as modified by passing through 4.7 cm of U have been analyzed. The results indicate an upper limit to the inelastic scattering cross section of Ra-Be neutrons in U of 2.5 barns and a degradation of energy to an average of about 200 kev. The corresponding qualities for Ra-B neutrons are 2.4 barns and 100 kev. (auth)

2570 Y-42
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
THE VAPOR PRESSURE OF URANIUM TETRAFLUORIDE. K. O. Johnsson. Oct. 20, 1947. Decl. Dec. 7, 1955. 19p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The vapor pressure of UF_4 has been measured in the temperature range 850 to 1000°C. The method is a static one, using the pressure of an inert gas balanced against the pressure of vaporous and solid UF_4 in equilibrium. The UF_4 vapor is separated from the gas, whose pressure is measured with common type gauges, by means of a thin monel diaphragm. (auth)

Refer also to abstracts 2428, 2443, and 2444.